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Report to the Chairman, Committee on
Governmental Affairs, U.S. Senate

September 1993

NUCLEAR NONPROLIFERATION AND SAFETY

Challenges Facing the International Atomic Energy Agency



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**National Security and
International Affairs Division**

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September 22, 1993

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The Honorable John Glenn
Chairman, Committee on Governmental Affairs
United States Senate

Dear Mr. Chairman:

As you requested, we are reporting on the (1) effectiveness of the International Atomic Energy Agency's (IAEA) safeguards program and the adequacy of program funding, (2) management of U.S. technical assistance for IAEA's safeguards program, and (3) effectiveness of IAEA's program for advising member states on nuclear power plant safety and the adequacy of program funding. We are reporting classified information on IAEA's efforts to conduct safeguards inspections in North Korea to you separately.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 30 days from the date of this report. At that time, we will send copies to the Secretaries of State and Energy, the Chairman of the Nuclear Regulatory Commission, and other interested parties. We will also make copies available to others on request.

This report was prepared under the direction of Joseph E. Kelley, Director-in-Charge, International Affairs Issues, National Security and International Affairs Division, and Victor S. Rezendes, Director, Energy Issues, Resources, Community, and Economic Development Division, who may be reached at (202) 512-4128 and (202) 512-3841, respectively, if you or your staff have any questions. Major contributors to this report are listed in appendix V.

Sincerely yours,

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Executive Summary

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Purpose

The discovery of Iraq's nuclear weapons program, North Korea's refusal to permit the International Atomic Energy Agency (IAEA) to conduct nuclear inspections (safeguards), and the Chernobyl nuclear power plant accident have focused greater attention on nuclear proliferation and the safety of nuclear power plants. These issues are of particular concern to IAEA, whose primary functions are to verify the peaceful use of nuclear material and to promote the use of nuclear energy.

The Chairman of the Senate Committee on Governmental Affairs asked GAO to review IAEA's safeguards and nuclear power plant safety programs. This report examines (1) the effectiveness of IAEA's safeguards program and the adequacy of program funding, (2) the management of U.S. technical assistance to IAEA's safeguards program, and (3) the effectiveness of IAEA's program for advising member states about the safety of nuclear power plants and the adequacy of program funding.

Background

IAEA is an international organization affiliated with the United Nations; it has 114 member states. The agency's safeguards and promotional responsibilities are outlined in a formal statute adopted in 1956 at a conference of 81 states that were members of the United Nations or U.N. specialized agencies.

Under its statute and the Treaty on the Non-Proliferation of Nuclear Weapons (NPT), IAEA is mandated to administer safeguards to detect diversions of significant quantities of nuclear material from peaceful uses. NPT binds signatory nonnuclear weapon states—states that had not manufactured and detonated a nuclear device by January 1, 1967—to accept IAEA safeguards on all nuclear material, referred to as “full-scope” safeguards. Some nonnuclear weapon states have not joined NPT, but have agreed to accept full-scope safeguards under other arrangements. Under binding agreements, full-scope safeguards states must declare all nuclear material to IAEA and IAEA regularly inspects all facilities or locations containing declared material.

For nonnuclear weapon states that have not joined NPT or otherwise agreed to accept full-scope safeguards, IAEA's inspections are limited to only specified material, equipment, and facilities. These states enter into safeguards agreements with IAEA, but are not obligated to declare all nuclear material. To promote the use of nuclear energy, IAEA implements programs in several areas, including the safety of nuclear power plants. A key component of IAEA's promotional activities is technical assistance to

member states interested in the use of nuclear technology and energy. Whereas safeguards are IAEA's mandated responsibility, regulating nuclear safety is a national responsibility. IAEA acts only as a technical adviser to member states on safety matters and, if requested, reviews the operational safety and other aspects of nuclear power plants.

IAEA funds safeguards and nuclear safety through its regular budget, supplemented by extrabudgetary contributions from the United States and others, and funds technical assistance through extrabudgetary contributions. Because of IAEA's dual regulatory and promotional role and the competing interests of member states, IAEA attempts to maintain a balance in funding safeguards and technical assistance. In 1992, IAEA expended \$59.4 million on safeguards—about one-third of its total regular budget expenditures of \$173.9 million. It also spent \$9.9 million on nuclear safety, \$43.4 million on other programs, and \$61.2 million for administration. In 1992, IAEA expended \$56.1 million in extrabudgetary contributions for technical assistance projects.

Since 1985, IAEA's regular budget, funded with assessments on member states, has been subject to "zero-real-growth" limits that permit nominal increases only for nondiscretionary costs. These costs include inflation and mandatory staff-related costs such as salaries.

Results in Brief

IAEA safeguards are a central element in international efforts to prevent the proliferation of nuclear weapons. However, IAEA does not have access to verify the peaceful use of all nuclear material because six states, including known proliferators, have not joined NPT or otherwise agreed to accept full-scope safeguards. These states are subject to only limited IAEA inspections. As IAEA members, non-full-scope safeguards states are eligible for the same membership privileges as full-scope safeguards states, such as receiving technical assistance and serving on IAEA's board.

The discovery of Iraq's nuclear weapons program highlighted weaknesses in IAEA's full-scope safeguards program. With its member states' support, IAEA focused on verifying declared inventories at declared sites and did not develop the means to detect undeclared activities. The agency lacked the necessary access, mindset, member support, and information to investigate whether full-scope safeguards states had fully disclosed their nuclear activities. In 1992, IAEA initiated measures to detect undeclared activities, such as (1) requesting and using information from member states on suspect nuclear activities of other states to support its

inspections and (2) seeking to inspect two suspect sites in North Korea. IAEA is also studying ways to extend its inspection access at declared and undeclared sites and to use sophisticated sampling and monitoring techniques to detect undeclared facilities. GAO supports these efforts.

Because of limits on budget growth and unpaid contributions, IAEA has had difficulty funding its safeguards program. Its financial situation could worsen as more facilities become subject to safeguards and IAEA implements new measures to strengthen safeguards. However, options exist to make more resources available for safeguards.

The U.S. technical assistance program for IAEA safeguards, overseen by an interagency coordinating committee—composed of representatives from the Departments of State and Energy, the Nuclear Regulatory Commission, and the Arms Control and Disarmament Agency—and a project office, has enhanced the agency's inspection capabilities. Although the committee and project office have recently taken steps to improve the program's management, some weaknesses still exist. Also, procedures do not exist to coordinate the program with other U.S. technical assistance to IAEA.

Since Chernobyl, IAEA has placed increasing emphasis on assisting member states in improving the safety of nuclear power plants. Despite funding shortfalls, IAEA is meeting its basic safety advisory responsibilities, but it has been unable to fully implement additional safety activities recommended by its members. Furthermore, IAEA's program for reviewing the operational safety of nuclear power plants has not been fully effective because the program is voluntary and states have not asked IAEA to review all nuclear reactors with serious problems. GAO believes that IAEA should have more discretion in selecting reactors for review.

Principal Findings

IAEA Does Not Have Access to Inspect All Nuclear Material

Six states—Algeria, Chile, Cuba, India, Israel, and Pakistan—have not agreed to join NPT or otherwise accept full-scope safeguards. In these states, IAEA inspects only specified material, equipment, and facilities.

India and Pakistan are known to have nuclear weapons development programs, and Israel is believed to have produced nuclear weapons.¹

Accepting full-scope safeguards is not a condition of IAEA membership because IAEA was established several years before the concept of full-scope safeguards emerged under NPT. Therefore, three of the six non-full-scope safeguards states—Algeria, India, and Pakistan—sit on IAEA's board and all six states have received technical assistance. As board members, states review whether full-scope safeguards states are complying with their safeguards agreements.

GAO believes that permitting non-full-scope safeguards states, including known proliferators, to sit on IAEA's board in judgment of full-scope safeguards states and to receive technical assistance could undermine IAEA's credibility. U.S. officials emphasized that revising IAEA's statute to revoke their privileges would face significant political opposition and could counter nonproliferation objectives because the six states may withdraw from IAEA. However, GAO notes that being a member of IAEA has not discouraged some of these states from pursuing weapons programs.

Weaknesses in IAEA's Full-Scope Safeguards

Prior to the discovery of Iraq's clandestine nuclear weapons program, IAEA, with its member states' support, focused on verifying inventories of declared material at declared sites through regular full-scope safeguards inspections. IAEA did not have a system to identify undeclared material or sites, nor did its inspectors look for indicators of clandestine activities during regular inspections. IAEA's members did not encourage IAEA to be more intrusive. Also, IAEA did not have information that might have raised suspicions about states' activities. For example, member states generally did not share intelligence information or report certain nuclear-related imports and exports.

Furthermore, IAEA is subject to limitations on its access. For example, IAEA's agreements do not provide for inspectors to inspect any location at any time unless IAEA has some evidence of suspect activities. In this case, IAEA must consult with the state to obtain access to conduct a "special inspection." In addition, during regular inspections, IAEA's inspectors are restricted to inspecting designated areas in declared facilities.

¹In February 1993, the Director of Central Intelligence testified before the Senate Governmental Affairs Committee that India and Pakistan have nuclear weapons development programs. In 1980, GAO reported that, in 1974, the U.S. Central Intelligence Agency noted that "we believe that Israel already has produced nuclear weapons." See Evaluation of U.S. Efforts to Promote Nuclear Non-Proliferation Treaty (ID-80-41, July 31, 1980).

IAEA Has Taken Measures to Strengthen Full-Scope Safeguards

Since the disclosures in Iraq, IAEA has initiated measures to detect clandestine activities in full-scope safeguards states. For example, IAEA is collecting additional information from member states and public sources on nuclear activities of other states. In February 1993, on the basis of information compiled from informal visits, inspections, and member states, IAEA informed North Korea of its intent to conduct a special inspection of two suspect sites, but it was denied access. In April 1993, IAEA referred the matter to the U.N. Security Council, which issued a resolution in May 1993 urging North Korea to grant access to IAEA. As of August 1993, the Security Council was awaiting the outcome of U.S. efforts to negotiate a solution with North Korea before taking further action.

IAEA is also exploring ways to extend its access, including to permit inspectors to inspect (1) additional areas within declared facilities during regular inspections and (2) sites other than declared facilities based only on indications of potential undeclared activities or sites—rather than having to compile specific evidence to support a special inspection. Furthermore, IAEA is examining the possibility of using techniques for monitoring the environment (air, water, and soil) to detect the presence of elements typically discharged from nuclear activities. GAO believes that IAEA's ability to develop an intrusive inspection program rests on the adoption of these measures.

Funding Shortfalls Affect IAEA's Safeguards Program

IAEA's safeguards funding requirements have been expanding because, since 1991, eight states have joined NPT or otherwise agreed to accept full-scope safeguards. To fund its expanding program, the safeguards department requested budget increases for 1992 and 1993. Because of zero-real-growth policy, the board approved a funding increase of only \$2.7 million for safeguards. Furthermore, for 1991 through 1993, the Russian Federation and others did not pay or were not expected to pay assessed contributions when due. As a result, the department had to defer or cancel inspections, equipment purchases, and other activities. Because of its financial difficulties, IAEA has been unable to maintain its equipment inventory or fully meet certain inspection goals.

IAEA estimates that its funding needs will continue to grow as more states and facilities become subject to safeguards and it begins to implement measures to strengthen safeguards. In fact, IAEA identified about \$21 million in requirements that will not be funded under its 1994 regular budget. To make more resources available for safeguards, IAEA's board could apply any surpluses—funds remaining unexpended at the end of a

budget year—to program activities or prioritize IAEA's requirements. If these measures did not yield sufficient funds, the board could classify safeguards expenses as nondiscretionary costs eligible for funding increases under zero real growth.

U.S. Technical Assistance Provides Key Safeguards Support; Some Management Practices Are Lacking

Since 1976, the United States has provided about \$88 million in key equipment and other technical assistance for IAEA safeguards under a State Department-funded program. Without this support, IAEA believes it would have difficulty meeting inspection goals and developing new safeguards approaches.

GAO found that the interagency coordinating committee for the program has not clearly defined the responsibilities of the program's project office for monitoring program contractors—national laboratories and private vendors. As a result, the project office was not aware of certain problems, such as cost overruns or disagreements between IAEA and contractors on project requirements. In July 1993, the coordinating committee established reporting requirements for contractors, and the project office developed a system to track contractors' expenditures and progress. However, the committee still has not clarified the project office's responsibilities, or arranged with IAEA to include reporting requirements in U.S.-funded contracts with private vendors.

In 1992, the Department of Energy began developing plans to provide direct technical assistance to IAEA's safeguards department on a regular basis, including some of the same types of support provided under the existing State Department-funded program. As of August 1993, no procedures existed to ensure that the two assistance efforts will be coordinated, and State and Energy officials disagreed on the need for formal coordination. GAO believes that without coordination, duplication or gaps in U.S. assistance to IAEA could occur.

IAEA's Efforts to Improve and Fund Nuclear Power Plant Safety

IAEA is addressing concerns about the safety of nuclear power plants, including Soviet-designed reactors, through various safety services, special projects, and technical support of international safety efforts. Despite budgetary constraints, IAEA has been able to execute its basic safety advisory responsibilities. However, the agency has had to defer or cancel some activities, such as meetings of experts to discuss safety issues, and rely more on extrabudgetary funds. Furthermore, IAEA has been unable to fully implement additional activities that its members recommended in

1991, such as strengthening certain aspects of its operational safety reviews of nuclear power plants.

As GAO reported in November 1991, the voluntary nature of IAEA's operational safety reviews does not ensure that IAEA will review problem reactors.² At that time, IAEA had reviewed only 16 of 39 older operating Soviet-designed reactors considered to have serious safety problems because states with the other 23 reactors had not requested a review. As of July 1993, these reactors still had not been subject to an operational safety review. Furthermore, as of July 1993, five states with operating nuclear reactors had not had any operational safety reviews.

GAO believes that IAEA should have more discretion in selecting reactors for operational safety reviews. U.S. officials are concerned that such action would shift responsibility from national regulatory bodies to IAEA and, therefore, weaken nuclear safety. GAO believes, to the contrary, that it would reinforce national efforts and ensure that problem reactors are periodically reviewed.

Recommendations

This report contains several recommendations to the Secretary of State for strengthening IAEA's safeguards program (see ch. 2), improving IAEA's ability to fund its safeguards program (see ch. 3), and improving the management of U.S. technical assistance to IAEA (see ch. 4).

Agency Comments

As requested, GAO did not obtain written agency comments. However, U.S. and IAEA officials provided comments on a summary of GAO's findings and generally agreed with GAO on the need to extend IAEA's inspection access and the impact of IAEA's financial situation. As previously discussed, U.S. officials expressed concern about revoking membership privileges of non-full-scope safeguards states and giving IAEA discretion in selecting reactors for operational safety reviews. They also differed on the need for a formal mechanism to coordinate U.S. technical assistance for IAEA safeguards. U.S. and IAEA officials also suggested modifications to some of the report language. GAO has incorporated their comments where appropriate.

²Nuclear Power Safety: Chernobyl Accident Prompted Worldwide Actions but Further Efforts Needed (GAO/NSIAD-92-28, Nov. 4, 1991).

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Abbreviations

ASSET	Assessment of Significant Safety Event Team
DOE	Department of Energy
EURATOM	European Atomic Energy Community
GAO	General Accounting Office
IAEA	International Atomic Energy Agency
ISPO	International Safeguards Project Office
NPT	Treaty on the Non-Proliferation of Nuclear Weapons
OSART	Operational Safety Review Team
POTAS	U.S. Program of Technical Assistance to IAEA Safeguards

Introduction

After the explosion of the first nuclear weapon in 1945, the United States undertook efforts to prevent the proliferation of nuclear weapons. Initially, U.S. policy reflected the view that denying nuclear technology was the best way to avoid proliferation, and it therefore prohibited the export of almost all nuclear equipment, materials, and technology. However, this policy did not prevent other countries, including the former Soviet Union, from developing nuclear weapons.

In the early 1950s, the U.S. government shifted its policy from denial of nuclear technology to controlled nuclear assistance and cooperation. In 1953, President Eisenhower, in a speech before the United Nations, proposed the open development of nuclear energy under voluntary international inspections and the creation of an international agency to (1) provide technical assistance to states interested in developing nuclear energy and (2) conduct inspections to verify the peaceful use of nuclear energy. This initiative led to several bilateral agreements for nuclear cooperation and, in 1957, to the establishment of the International Atomic Energy Agency (IAEA).

In the early 1960s, IAEA established an inspection program based on a system of technical measures, referred to as safeguards, designed to detect the diversion of significant quantities of nuclear material. Initially, IAEA applied safeguards to equipment, facilities, and material under its supervision, or material covered under bilateral agreements, if requested by signatory states. The Treaty on the Non-Proliferation of Nuclear Weapons (NPT), effective in 1970, expanded IAEA's responsibilities because it required signatory nonnuclear weapon states—countries that had not manufactured and detonated a nuclear device before January 1, 1967—to agree not to acquire nuclear weapons and to accept IAEA safeguards on all source and fissionable nuclear material¹ in peaceful nuclear activities, hereinafter referred to as "all nuclear material."

The Treaty of Tlatelolco, which prohibits nuclear weapons in signatory Latin America countries, and the South Pacific Nuclear Free Zone Treaty, which bans the stationing and testing of nuclear weapons within the zone of the treaty, require commitments to IAEA safeguards similar to those made by NPT nonnuclear weapon states. Under NPT, nuclear weapon states (China, France, the Russian Federation, the United Kingdom, and the United States) pledged to facilitate the transfer of peaceful nuclear technology to nonnuclear weapon states, but not to assist them in acquiring nuclear weapons.

¹Material, such as enriched uranium and plutonium, that could be used to produce nuclear weapons.

IAEA's Organization and Statutory Mandate

IAEA is an autonomous intergovernmental organization affiliated with the United Nations, headquartered in Vienna, Austria. Its principal components are a General Conference composed of representatives of IAEA's entire membership, a 35-member Board of Governors, and a secretariat headed by a Director General. Under IAEA's statute,² the Director General is under the authority and subject to the control of the board, and performs duties in accordance with regulations adopted by the Board. As the executive body, the board makes policy and reviews IAEA's budget and programs. The board's membership is based on technological capability and geographic representation. As of May 1993, 114 states were members of IAEA. Appendix I provides a listing of these states, including board members.

According to its statute, IAEA's objectives are to promote the peaceful use of nuclear energy and to verify that nuclear material under its supervision or control is not used to further any military purpose. To achieve these objectives, IAEA is authorized to

- encourage and assist research on, and development and practical application of, atomic energy;
- make provision for materials, services, equipment, and facilities to meet the needs of research on, and development and practical application of, atomic energy;
- foster the exchange of scientific and technical information;
- establish and administer safeguards against the diversion of nuclear materials intended for use in civil nuclear programs to military purposes; and
- establish or adopt standards of safety for the protection of health and minimization of danger to life and property.

IAEA's member states have differing opinions on the relative importance of IAEA's regulatory and promotional responsibilities. The United States and others believe that safeguards are IAEA's most important function. Many developing countries believe that facilitating the transfer of nuclear technology is just as important.

To carry out its promotional responsibilities, IAEA implements programs in several areas, including nuclear energy and safety, nuclear power, and research and isotopes—applications of nuclear technology to food, agriculture, physical and chemical sciences, health, industry, and earth

²IAEA's statute was adopted by a conference convened in 1956 under a U.N. General Assembly resolution. The conference participants were 81 states that were members of the United Nations or U.N. specialized agencies.

sciences. A key component of these programs is technical assistance, such as material, equipment, and training, that IAEA provides to member states as a means of transferring skills and knowledge relating to the peaceful use of nuclear technology and energy.

Whereas safeguards are IAEA's mandated responsibility, regulating nuclear safety is a national responsibility. IAEA acts only as a technical adviser to member states on safety matters and, if requested, reviews the operational safety and other aspects of nuclear power plants.

To administer safeguards, IAEA inspectors conduct on-site inspections at nuclear facilities and other locations in accordance with binding agreements with states. Using technical criteria, they perform various activities, including taking measurements and reconciling inventories of nuclear material to verify that all material is accounted for. IAEA does not inspect all nuclear facilities and material in every state. IAEA's specific access to conduct inspections is based on the type of safeguards agreements concluded with a state. If a nonnuclear weapon state joins NPT or otherwise agrees to accept safeguards on all nuclear material, IAEA inspects all nuclear material, referred to as "full-scope" safeguards.³

Under full-scope safeguards agreements, a state must declare all nuclear material and its location to IAEA. IAEA conducts initial "ad hoc" inspections to verify the accuracy of this declaration, followed by periodic routine inspections at all declared sites to reconfirm inventory levels. If IAEA has reason to believe that a state has not fully disclosed its nuclear activities, it may conduct a "special" inspection at any location or facility—declared or undeclared within the state.

For nonnuclear weapon states that have not joined NPT or otherwise agreed to accept full-scope safeguards, IAEA's inspections are generally limited to facilities that contain material or items (1) acquired from states that require IAEA safeguards as a condition of supply, (2) supplied under IAEA projects or, (3) that the state has voluntarily permitted IAEA to safeguard. Nuclear weapon states are not subject to safeguards under NPT, but they have voluntarily permitted IAEA to inspect some facilities.

³Some states have not joined NPT or other treaties, but have agreed to accept full-scope safeguards under special agreements with IAEA.

IAEA's Budget

IAEA's financial resources consist primarily of assessed and extrabudgetary contributions from member states.⁴ The assessed contributions fund IAEA's regular budget, which covers the administrative and operating expenses of IAEA's programs, including safeguards and nuclear safety. IAEA uses extrabudgetary contributions primarily to cover the cost of technical assistance projects⁵ and activities related to approved programs funded under the regular budget. Unused extrabudgetary contributions may be carried over from year to year until approved projects are completed.

In 1992, IAEA expended about one-third of its total regular budget expenditures of \$173.9 million for safeguards, with the remainder expended for other programs and administration. IAEA also expended about 55 percent of its total extrabudgetary contributions of \$102.3 million for technical assistance. Table 1.1 shows IAEA's expenditures of regular budget funds and extrabudgetary contributions in 1992.

Table 1.1: IAEA's Expenditures of Regular Budget Funds and Extrabudgetary Contributions in 1992

Dollars in millions		
Funding category	Expenditure	Percent
Regular budget		
Safeguards	\$59.4	34
Research and isotopes	25.5	15
Nuclear energy	17.9	10
Nuclear safety	9.9	6
Administration	61.2 ^a	35
Total	\$173.9^b	100
Extrabudgetary contributions		
Technical assistance	56.1	55
Other activities	17.4	17
Amount carried over to 1993	28.8	28
Total	\$102.3	100

Note: Figures are based on an exchange rate of one U.S. dollar equals 10.95 Austrian schillings.

^aFigure includes administrative expenses for all programs funded under the regular budget and IAEA's technical assistance program.

^bFigure excludes expenditures for reimbursable support that IAEA provided to other organizations.

⁴IAEA derives a small amount of income from reimbursable services provided to member states and other international organizations.

⁵Each year, states set an overall funding target for extrabudgetary contributions to be used for technical assistance projects and contribute individually toward the target.

Because of its dual regulatory and promotional role, and the competing interests of member states, IAEA has attempted to maintain a balance between funding for safeguards and technical assistance. As shown in table 1.1, IAEA expended similar amounts in 1992 for these programs—\$59.4 million for safeguards and \$56.1 million for technical assistance.

U.S. Support for IAEA

The United States has historically been a primary supporter of IAEA and its largest contributor. It considers IAEA to be the central element of international efforts to prevent the proliferation of nuclear weapons and the primary focal point for international cooperation in nuclear safety. In fiscal year 1992, the total U.S. contribution to IAEA was about \$79 million, including about \$52 million for its assessed portion of IAEA's regular budget and \$27 million in extrabudgetary contributions consisting of

- \$16.3 million for IAEA's technical assistance program;
- \$7 million to assist IAEA in improving its safeguards program;
- \$2.5 million, in response to a special appeal from IAEA for additional extrabudgetary contributions, to fund purchases of safeguards equipment and pay for travel to negotiate safeguards agreements;
- \$450,000 to provide experts to assist IAEA, on a short-term basis, with key initiatives in various program areas, including nuclear safety and research;
- \$500,000 for nuclear safety activities in Eastern Europe; and
- \$250,000 for a training program for safeguards inspectors.

Objectives, Scope, and Methodology

The Chairman of the Senate Committee on Governmental Affairs asked us to review IAEA's safeguards and nuclear power plant safety programs. We reviewed (1) the effectiveness of IAEA's safeguards program and the adequacy of program funding, (2) the management of U.S. technical assistance to IAEA's safeguards program, and (3) the effectiveness of IAEA's program for advising member states about the safety of nuclear power plants and the adequacy of program funding.

To review IAEA's safeguards and safety programs, we interviewed officials and reviewed documents at the Department of State, Arms Control and Disarmament Agency, Department of Energy (DOE), and Nuclear Regulatory Commission in Washington, D.C., and at IAEA and the U.S. Mission to International Organizations in Vienna, Austria. We also interviewed several former U.S. and IAEA officials with safeguards and nonproliferation expertise and representatives from a total of 24 IAEA

member states regarding their views on IAEA's safeguards and safety programs.

To review the U.S. technical assistance program, we interviewed officials and reviewed documents at State, DOE, the Nuclear Regulatory Commission, the Arms Control and Disarmament Agency, IAEA, and the U.S. Mission. We also interviewed officials at Brookhaven, Sandia, and Los Alamos National Laboratories and reviewed records on about 50 U.S. technical assistance projects—some selected randomly and others based on recommendations from IAEA and U.S. officials. Furthermore, we met with officials from Aquila Technologies Group, Inc., to discuss their U.S.-funded contracts for providing safeguards support to IAEA and from Koh Systems, Inc., a consulting firm, to discuss its report on the U.S. technical assistance program.

We conducted our review between April 1992 and August 1993 in accordance with generally accepted government auditing standards. As requested, we did not obtain written agency comments. However, U.S. and IAEA officials provided comments on a summary of our findings, and we have incorporated their comments where appropriate.

Strengthening IAEA's Safeguards Program

Within the international community, IAEA safeguards are a key mechanism for verifying the peaceful use of nuclear material. However, IAEA's mandate for administering safeguards does not extend to all nuclear material because six states have not joined NPT or otherwise agreed to accept full-scope safeguards. Under its safeguards agreements with these states, IAEA performs inspections only on a limited basis and is not responsible for verifying the use of all nuclear material. Although they have not joined NPT or otherwise agreed to full-scope safeguards, the six states are nevertheless eligible for the same IAEA membership privileges as full-scope safeguards states, including serving on IAEA's board and receiving technical assistance.

Furthermore, the discovery of Iraq's clandestine nuclear weapons program following the Persian Gulf War highlighted weaknesses in IAEA's full-scope safeguards program. With its member states' support, IAEA focused on verifying declared inventories of nuclear material at declared sites during routine inspections. Its inspection program was not designed to detect undeclared material or activities. In fact, IAEA lacked the necessary mindset, member support, information, and access to investigate whether full-scope safeguards states had fully disclosed their nuclear activities.

Since the disclosures in Iraq, IAEA has initiated measures to detect clandestine activities, including requesting and using information from member states on suspect nuclear activities of other states to support its inspections, and requesting access for a special inspection in North Korea. IAEA is also exploring ways to extend its inspection access at declared and undeclared sites.

IAEA Does Not Have Access to All Nuclear Material

In support of international efforts to stem proliferation, IAEA's safeguards inspections provide an important mechanism for verifying the peaceful use of nuclear material. During 1992, IAEA conducted safeguards inspections in 3 nuclear weapon states and in 55 nonnuclear weapon states.¹ IAEA conducted full-scope safeguards inspections in 47 of the 55 nonnuclear weapon states (see app. II) and limited inspections in the other 8 states. Of the eight, six—Algeria, Chile, Cuba, India, Israel, and Pakistan—have not joined NPT or otherwise accepted full-scope safeguards, and two—Argentina and Brazil—have accepted full-scope safeguards, but their safeguards agreements with IAEA have not yet entered into force.

¹As discussed in chapter 3, because of funding shortfalls, IAEA curtailed inspections during 1992 in the Russian Federation and United States.

Because they have not agreed to accept full-scope safeguards, the six states are not legally obligated to declare or submit all nuclear material for inspection. IAEA has safeguards agreements with these states and conducts inspections, but only at facilities that contain material or items

(1) acquired from states that require IAEA safeguards as a condition of supply,² (2) supplied under IAEA projects, or (3) that the state has voluntarily permitted IAEA to safeguard. Of the six states, India, Israel, and Pakistan have significant nuclear activities. India and Pakistan are known to have programs to develop nuclear weapons, and Israel is believed to have produced nuclear weapons.³ The exact number of facilities and quantity of nuclear material not subject to safeguards in the six states are unknown.

Because the concept of full-scope safeguards, as embodied in NPT, emerged 10 years after IAEA was established, the agency's statute does not distinguish between the membership privileges of full-scope and non-full-scope safeguards states. All states are eligible for the same privileges, including serving on the board and receiving technical assistance. Currently, Algeria, India, and Pakistan are board members, and Algeria chairs the board. As board members, states' representatives perform various functions, including assessing states' compliance with safeguards agreements. Consequently, in February 1993, the non-full-scope safeguards states had the opportunity to consider the refusal of North Korea—a full-scope safeguards state—to permit IAEA to conduct a special inspection. From 1958 to 1992, IAEA provided about \$43.5 million in technical assistance to the six non-full-scope safeguards states—about 9 percent of total expenditures for such assistance. Table 2.1 shows the distribution of these funds among the six states.

²For example, NPT states are obligated not to transfer source or fissionable nuclear material, or equipment and items used to process or produce such material, to nonnuclear weapon states unless the item transferred is subject to safeguards.

³In February 1993, the Director of Central Intelligence testified before the Senate Governmental Affairs Committee that India and Pakistan have nuclear weapons development programs. In 1980, we reported that, in 1974, the U.S. Central Intelligence Agency noted that "we believe that Israel already has produced nuclear weapons." See Evaluation of U.S. Efforts to Promote Nuclear Non-Proliferation Treaty (ID-80-41, July 31, 1980).

Table 2.1: IAEA Technical Assistance to Non-Full-Scope Safeguards States (1958-92)

Dollars in millions	
State	Amount of assistance
Algeria	\$4.2
Chile	9.8
Cuba	8.9
India	7.5
Israel	1.5
Pakistan	11.6
Total	\$43.5

Permitting states that will not allow IAEA to verify the peaceful use of all of their nuclear material, including known proliferators, to sit on the board in judgment of full-scope safeguards states and receive technical assistance could undermine the credibility of IAEA. However, State Department officials emphasized that accepting full-scope safeguards is not a condition of IAEA membership and that revoking privileges of non-full-scope safeguards states would require a revision of IAEA's statute. They said that obtaining consensus to revise the statute would be a large undertaking that would face significant political obstacles. Furthermore, the officials believed that changing the current situation may be counter to nonproliferation objectives. Rather than compelling the six states to accept full-scope safeguards, the states may withdraw from IAEA, thereby canceling their offers to permit IAEA to inspect some facilities. We, however, note that being a member of IAEA has not discouraged some of these states from pursuing weapons programs.

IAEA's Full-Scope Safeguards Focused on Verifying Declared Inventories

Prior to the discovery of undeclared nuclear material, facilities, and activities in Iraq, IAEA, with its member states' support, focused on conducting routine inspections at declared facilities to verify that declared inventories of nuclear material had not been diverted for military purposes. Its inspectors concentrated on measuring material and reconciling inventory records. IAEA had not developed the means to determine whether undeclared material and sites might exist, nor did its inspectors actively look for indications of clandestine activities. IAEA's member states supported IAEA's limited approach and did not encourage the agency to be more intrusive.

Furthermore, IAEA lacked access to certain information that might have raised suspicions about states' nuclear activities. Member states generally

did not provide intelligence information to IAEA about potential suspect activities or facilities of other states because they believed that IAEA might be susceptible to leaks of this information. They typically felt that detection of clandestine activities should be handled by national intelligence means. As a result, IAEA's knowledge of states' specific nuclear activities was generally limited to information obtained during inspections, states' reports on inventories and selected nuclear material imports and exports, and news media reports.

Limitations on IAEA's Access Hinder Detection of Clandestine Activities

IAEA is subject to certain limitations in applying full-scope safeguards that hinder its ability to investigate whether undeclared material or sites exist. For example, its safeguards agreements do not provide for IAEA to inspect any location—declared or undeclared—at any time (outside of regularly scheduled routine inspections) without some evidence that the site is suspect. A few states have voluntarily permitted IAEA to visit any location at any time without a specific reason, and IAEA has benefitted from making such visits. In addition, IAEA's agreements do not provide for IAEA inspectors to verify the use of any material formally exempted from safeguards.

IAEA Is Subject to Restrictions on Inspecting Declared and Undeclared Sites

During routine inspections at declared facilities, IAEA's full-scope safeguards agreements permit inspectors to inspect "strategic points"—where material appears or can be presented in such a form that it may be measured—but do not give them access to other areas within the facility or adjacent buildings. During a routine inspection at a safeguarded research reactor in Iraq, for example, IAEA inspectors asked Iraqi officials about buildings adjacent to the reactor. The officials replied that the buildings were used for nonnuclear research. Because they were not declared sites and IAEA did not have any evidence of suspect activity, IAEA did not have a basis to inspect the buildings. In fact, one of the buildings was a radiochemical laboratory used for research on plutonium separation.

Furthermore, the safeguards agreements require IAEA to notify states in advance of routine inspections—at least 24 hours for facilities or sealed stores containing plutonium or uranium enriched to more than 5 percent and 1 week in all other cases. IAEA is permitted to make some unannounced or short-notice inspections. However, IAEA must advise the state periodically of its general program of announced and unannounced inspections, specifying the general period when inspections are foreseen.

IAEA and U.S. officials noted that to be effective, most routine inspections must be coordinated with the state in advance to enable inspectors to obtain visas and facility operators to prepare facilities for inspection. Because of IAEA's advance notice, states generally know when and where inspectors will be present. In Iraq, operators of the safeguarded research reactor generally knew when IAEA would conduct its twice-a-year inspections. Between these inspections, they clandestinely irradiated undeclared material in the reactor and reprocessed the resulting irradiated fuel at the radiochemical laboratory to chemically separate 3 grams of plutonium.

IAEA's safeguards agreements do not permit IAEA to inspect any undeclared site unless it has a specific reason to believe that a state has not fully disclosed the extent of its nuclear activities. Under these circumstances, IAEA has the authority to conduct a special inspection, but it still must first consult with the state. Most of Iraq's clandestine nuclear activities took place at undeclared sites. According to an IAEA official, IAEA was aware of media reports on Iraq's alleged nuclear activities, but the agency did not have specific evidence of undeclared sites or activities and, therefore, did not seek to conduct a special inspection.

**Some States Have
Voluntarily Permitted IAEA
to Visit Any Location at
Any Time**

During 1992, the governments of Iran, North Korea, and South Africa offered to extend IAEA's access beyond that specified in their full-scope safeguards agreements with the agency. Specifically, they offered to permit senior IAEA officials to visit any location at any time—declared or undeclared—for the purpose of promoting confidence and transparency in their nuclear programs.

On the basis of these offers, IAEA made several visits during 1992, including visits to undeclared sites that would have otherwise been inaccessible unless IAEA had specific evidence to justify a special inspection. As discussed later in this chapter, IAEA's visits in North Korea, coupled with information obtained during initial formal inspections and from member states, revealed discrepancies in North Korea's inventory declaration and prompted IAEA to call for a special inspection of two suspect sites. However, North Korea refused to grant IAEA access to the sites, in effect negating its voluntary offer. In the other states, IAEA visited several locations, including a military installation and a nuclear research facility. During these visits, IAEA did not report the discovery of any clandestine activities.

Since its initial offer to extend IAEA's access in 1992, South Africa issued a statement in March 1993 revealing that it had assembled and dismantled six nuclear devices before joining NPT and accepting full-scope safeguards. The statement also noted that all nuclear material removed from the devices has since been included on inventory records submitted to IAEA. In an unprecedented move, South Africa offered to grant IAEA access to all sites and records relevant to its terminated nuclear weapons program. IAEA is currently in the process of accounting for material removed from the devices.

Safeguards Agreements Do Not Provide for IAEA to Verify the Use of Exempted Material

Under its safeguards agreements—both full-scope and non-full-scope—IAEA may exempt certain nuclear material from inspection. At a state's request, IAEA may grant an exemption if material is (1) special fissionable material to be used in gram quantities or less as a sensing component in instruments; (2) nuclear material to be used in nonnuclear activities, such as the production of alloys or ceramics; (3) plutonium of a certain isotopic concentration; or (4) not in excess of certain limited quantities—ranging from 1 kilogram of plutonium to 20 metric tons of depleted uranium—irrespective of its use. In the latter case, the quantities are considered insignificant in terms of utility in making nuclear weapons, and states generally seek such exemptions so that they can use the material in research activities.

If IAEA grants an exemption, the state is still obligated through its safeguards agreements to use exempted material only for peaceful purposes, and it must initially inform IAEA of the intended use of the material. However, the state is not required to report on the actual use unless the material is to be processed or stored together with safeguarded material. In this case, the material must be de-exempted and safeguards reapplied. Furthermore, the agreements do not provide for IAEA to verify the actual use. Because of IAEA's restrictions on publishing information on states' nuclear activities, we were unable to obtain data on the number of exemptions granted or the quantities of exempted material.

Iraq took advantage of this loophole by obtaining exemptions between 1975 and 1989 for a small quantity of material—four fresh fuel assemblies and one spent (used) fuel assembly—and then using the spent assembly for unauthorized purposes. The spent fuel assembly was part of the material that Iraq used in conducting research to separate plutonium at the radiochemical laboratory. U.S. officials acknowledged that, in principle, permitting IAEA to verify the use of exempted material might discourage

states from using such material for clandestine activities. However, they noted that IAEA would have to increase its inspection activities and therefore would need additional funding. They believed that other measures, such as increasing IAEA's inspection access, would more effectively strengthen IAEA's safeguards than expending significant effort to verify small quantities of exempted material that are technically insignificant.

IAEA Has Taken Measures to Strengthen Full-Scope Safeguards

Following the events in Iraq, IAEA's Director General, supported by IAEA's board, initiated measures to improve IAEA's capability to detect clandestine activities. At IAEA's request, in February 1992, the board reaffirmed the agency's right of access to any location and to information under its full-scope safeguards agreements. In February 1993, IAEA informed North Korea of its intent to conduct a special inspection of two undeclared sites; however, North Korea refused to grant access and the matter is now pending action by the U.N. Security Council.

To expand its knowledge of nuclear activities in full-scope safeguards states, IAEA requested member states to share information on suspect undeclared activities of other states and to expand their reporting of imports, exports, and facility design. IAEA plans to analyze this information, as well as data from public sources, to identify inconsistencies with declared activities. IAEA is also exploring measures to strengthen full-scope safeguards inspections, such as extending inspectors' access to undeclared facilities and to additional areas within declared facilities, and using environmental monitoring techniques.

IAEA Requested Access to Conduct a Special Inspection

In February 1992, IAEA's board reaffirmed IAEA's right to conduct a special inspection at any location—declared or undeclared—if the agency has a specific reason to believe that a state has not fully disclosed its nuclear activities. Under its full-scope safeguards agreements, IAEA may conduct a special inspection to verify special reports⁴ or if information provided by the state is not adequate for IAEA to execute its safeguards responsibilities. If a state denies access, IAEA does not have enforcement authority. Rather, it must refer the matter to its board and ultimately to the U.N. Security Council. The agency's safeguards agreements do not specify parameters, such as the type or level of evidence needed to justify an inspection or the time frames for the IAEA, board, Security Council, or state to take action.

⁴States are required to submit such reports if a loss of material may have occurred or conditions in a facility changed such that the unauthorized removal of material becomes possible.

U.S. and IAEA officials believe that the lack of parameters allows greater flexibility for dealing with a state's denial of access.

In support of IAEA's authority to conduct special inspections, the board also reaffirmed IAEA's right to obtain information on states' nuclear activities, in accordance with its statute and full-scope safeguards agreements. In February 1992, IAEA requested that member states voluntarily share information on suspect undeclared activities in other states, and some states have responded.

Until February 1993, IAEA had never conducted or attempted to conduct a special inspection to investigate potential undeclared facilities or activities.⁵ IAEA officials stated that they had never received information from any source that would have justified such an inspection. Using information obtained during informal visits and formal inspections and from member states, IAEA identified inconsistencies in North Korea's declaration of its nuclear material and activities, and the possible existence of two undeclared nuclear waste sites. On February 10, 1993, IAEA officially informed North Korea that it intended to conduct a special inspection to clarify these discrepancies and requested access to the two undeclared locations. North Korea denied access to IAEA, and on February 18, 1993, IAEA reported the matter to the board. The board determined that the inspection was "urgent and essential" and gave North Korea 1 month to permit access. On March 12, North Korea announced its intention to withdraw from NPT. On April 1, IAEA's board found that North Korea was in noncompliance with its safeguards agreement and adopted a resolution requesting IAEA to refer the matter to the U.N. Security Council. Of the 35 board members, 29 states voted for the resolution (including 1 non-full-scope safeguards state), 4 states abstained (including 2 non-full-scope safeguards states), and 2 states opposed the resolution.

On May 11, 1993, the Security Council adopted a resolution urging North Korea to permit IAEA to conduct its special inspection. Since that time, North Korea has announced that it would not withdraw from NPT. As of August 1993, however, it still had not granted access to IAEA. The United States is currently engaged in bilateral discussions with North Korea on the matter. According to a U.S. official, the Security Council is awaiting the outcome of these discussions before deciding whether to take further action. We are reporting classified information on this matter separately to the Chairman of the Senate Governmental Affairs Committee.

⁵In 1992, IAEA conducted a special inspection at a declared site in Romania after Romanian officials informed IAEA that its former government had produced a small amount of undeclared material.

IAEA Plans to Expand Its Knowledge of Nuclear Activities

IAEA is taking steps to collect additional information on states' nuclear activities. In addition to requesting information on suspect undeclared activities of other states, IAEA invited member states in July 1992 to voluntarily report the production, import, and export of all nuclear material, as well as certain sensitive equipment and nonnuclear material.⁶ States had been reporting production, imports, and exports of all nuclear material used for nuclear purposes, but only certain nuclear material used for nonnuclear purposes. They had not been reporting on equipment. As of July 1993, 24 states, including the United States, had agreed to expand their reporting, but only a few had begun providing information. IAEA officials hope that more states will participate, but because the major nuclear suppliers have consented, they believe that IAEA will have access to data on most imports and exports.

IAEA also proposed that states provide information on the design of new or modified facilities not later than 180 days before the start of construction. Previously, states provided such data prior to the time that the facility was scheduled to receive nuclear material. IAEA uses design information to verify that facilities are configured only for peaceful uses and to devise inspection approaches. Therefore, the agency preferred earlier notification to enhance its knowledge and to reinforce confidence that the facility would be used for peaceful purposes. IAEA's board endorsed IAEA's proposal, and IAEA is modifying agreements with affected states to reflect the board's decision.

Furthermore, IAEA intends to obtain more information on worldwide nuclear activities from media reports and other public sources. It has requested assistance from the United States in identifying commercial data bases covering nuclear imports, exports, construction, and other related subjects. In 1992, DOE arranged for IAEA to purchase a nonprofit group's data base that is derived from media and other sources and provides current data on worldwide nuclear import and export activity.

Using the above information and data obtained from member states on suspect undeclared activities, IAEA plans to profile full-scope safeguards states and identify potential discrepancies with states' declarations. To support this effort, IAEA has been designing a data base to compile the information it receives on nuclear activities. According to an IAEA official, IAEA will profile only those states subject to full-scope safeguards because IAEA has an obligation under NPT or other arrangements to verify that these

⁶Such sensitive equipment and nonnuclear material could possibly be used to develop a weapons capability. Examples include component parts of reactors and chemical compounds used in plants that produce enriched uranium.

states are not using any nuclear material for other than peaceful purposes. It does not have the same responsibility for non-full-scope safeguards states.

Some U.S. officials have raised questions about IAEA's plans to develop profiles because they believe IAEA may duplicate the efforts of member states that already perform such analysis and provide intelligence data to IAEA. However, IAEA believes that it needs an independent capability to supplement and assess information provided by member states.

IAEA Is Exploring Methods to Extend Its Inspection Access

In September 1992, IAEA's Director General requested IAEA's Standing Advisory Group on Safeguards Implementation to reexamine IAEA's implementation of safeguards and, among other things, to identify methods for increasing IAEA's capability to detect undeclared activities. In its June 1993 report, the advisory group concluded that the current full-scope safeguards system must be enhanced to provide significant confidence that states do not have undeclared nuclear facilities and are not conducting undeclared activities at declared nuclear facilities. The group advised IAEA to consider several new measures, including

- using techniques to monitor the environment (air, water, and soil) at declared facilities and other sites to detect the presence of isotopes, chemical elements and compounds, and other emissions typical of nuclear activities;
- inspecting additional areas—beyond strategic points—within declared facilities;
- increasing unpredictability in the location and timing of routine inspections; and
- conducting inspections at sites other than declared facilities based on initial indications of potential undeclared activities or sites.

In the latter case, the group envisioned that IAEA would be able to gain access and inspect a site if its evaluation of information generated from member states or other sources prompted questions as to whether undeclared activities or facilities might exist. IAEA would first consult with the state concerned and, if questions remained, would conduct inspections. However, IAEA would not need to compile the type of specific evidence required to justify a special inspection.

To implement the suggested measures, the group noted that IAEA would not have to revise its safeguards agreements. Rather, IAEA could develop a

standard arrangement, to be made with each full-scope safeguards state, with provisions for using environmental monitoring and extending access beyond that permitted under existing agreements.

The group suggested that the arrangement be modeled after provisions in the Convention on the Prohibition of Chemical Weapons for "challenge" inspections. Such inspections may be conducted at the request of a state if it believes that another state may have violated the convention. The convention provides for "managed" access to the site or site(s) in question. Specifically, the inspection team and state negotiate the extent and nature of access to particular areas within a site, the nature of sampling and other inspection activities, and the provision of information. During the inspection, states have the right to take measures to protect sensitive installations and prevent disclosure of confidential information and data not related to chemical weapons.

At its June 1993 meeting, the board agreed that IAEA's Director General should (1) arrange for evaluation and field tests of certain measures identified by the group, (2) direct the group to continue its evaluation, and (3) report to the board in December 1993 on a program for specific follow-up actions. As of July 1993, three states had offered sites for field tests of environmental monitoring techniques and IAEA was discussing arrangements with these states. The advisory group is now awaiting further instruction from the Director General on continuing its work.

Conclusions

IAEA safeguards are a cornerstone of international efforts to stem nuclear proliferation. The discovery of Iraq's clandestine nuclear weapons program and inconsistencies in North Korea's declaration of its nuclear activities emphasize the need for an intrusive safeguards system capable of detecting undeclared nuclear material and sites. IAEA's initiatives to collect and use information from member states and other sources on other states' activities and its attempt to conduct a special inspection in North Korea demonstrate that IAEA is adopting a more aggressive approach. However, if measures to extend its inspection access, as suggested by the agency's safeguards advisory group, are not implemented, IAEA will be unable to develop an intrusive safeguards system. In this context, any arrangement with states should minimize restrictions on the extent and nature of IAEA's access to declared and undeclared sites.

Furthermore, IAEA's access to inspect nuclear material in the six states that have not accepted full-scope safeguards remains limited. Granting non-full-scope safeguards states the privilege of board membership and allowing IAEA to promote the use of nuclear energy in such states is questionable. We, however, recognize that revising the agency's statute to require states to accept full-scope safeguards as a condition of IAEA membership would face significant political difficulties.

Recommendations

To strengthen IAEA's full-scope safeguards, we recommend that the Secretary of State fully support the measures recommended by IAEA's safeguards advisory group and take the lead in gaining the support of IAEA's board to adopt the measures.

To expand IAEA's safeguards coverage to all nuclear material and enhance the agency's credibility, we also recommend that the Secretary of State encourage all IAEA member states to accept full-scope safeguards.

IAEA Is Having Difficulty Funding Its Safeguards Program

IAEA's safeguards responsibilities are expanding as more countries and facilities become subject to inspection. However, in the past few years, limits on budget growth and forced budget reductions due to unpaid contributions, primarily from the Russian Federation, have affected IAEA's ability to fund its safeguards program. Because of funding shortfalls, IAEA has not been able to maintain or upgrade its equipment inventory or meet certain inspection goals. IAEA has solicited additional extrabudgetary contributions to fund certain program activities; however, this support has not met all of its needs. IAEA also experiences cash flow problems because the U.S. contribution is paid late each year.

IAEA is reexamining its implementation of safeguards to identify potential cost savings, but believes that the opportunities are limited without reducing the program's effectiveness. In the future, IAEA may need more funding to meet its expanding responsibilities and to implement measures to strengthen safeguards. Our review indicated that some of IAEA's difficulties in funding safeguards could be alleviated if its board permitted IAEA to use any funds remaining unexpended from one year's budget to pay for program activities in subsequent budget years, and to prioritize funding requirements across-the-board. If these measures do not generate sufficient funds, the board could classify safeguards as nondiscretionary costs—because safeguards are mandated by treaty. Under IAEA's current budget policy, nominal funding increases are allowed for nondiscretionary costs.

IAEA's Safeguards Responsibilities Are Expanding

IAEA is experiencing an increase in its inspection requirements. IAEA completed full-scope safeguards agreements with Argentina, Brazil, and South Africa in 1991 and with Lithuania and North Korea in 1992.¹ Also, in 1992, three former Soviet republics—Azerbaijan, Estonia, and Uzbekistan—joined NPT and several other republics have expressed interest in joining. IAEA expects to negotiate agreements with these countries and implement safeguards in the near future. Furthermore, several new facilities are expected to become operational by the end of the decade.

During 1992, IAEA began conducting activities in accordance with its new and future obligations. For example, IAEA officials performed initial inspections in South Africa and North Korea to verify initial inventory

¹IAEA's agreement with Argentina and Brazil has not yet entered into force; it is pending ratification by Brazil. In 1991, IAEA also became involved, based on a U.N. resolution, in conducting inspections in Iraq in the aftermath of the Gulf War. IAEA's activities in Iraq are primarily funded by the United Nations.

reports and visited Argentina, Belarus, Brazil, Kazakhstan, Lithuania, and Ukraine to discuss the application of safeguards. Furthermore, because of South Africa's March 1993 announcement that it had developed and dismantled six nuclear devices before joining NPT, IAEA will have to perform additional inspections to account for material removed from the devices.

IAEA Has Been Subject to Overall Budget Limits and Program Reductions

Since 1985, IAEA's regular budget has been subject to a policy of "zero real growth" that limits growth to nominal increases in nondiscretionary costs. These costs include inflation and mandatory staff-related costs, such as salaries.² The U.S. position on zero real growth is that increases in safeguards funding requirements, such as obligations stemming from new safeguards agreements or the addition of facilities under existing agreements, should be classified as nondiscretionary costs. In the U.S. view, IAEA has no discretion in funding these activities because its statute, NPT, and other treaties require IAEA to administer safeguards. Therefore, increases in the safeguards budget for such activities should be allowed under IAEA's zero-real-growth policy. However, many member states do not agree with the U.S. position and adhere to a stricter interpretation of zero real growth that limits nondiscretionary costs to inflation and mandatory staff-related costs.

IAEA has generally stayed within zero real growth except for three slight increases. In the 1987 and 1988 regular budgets, IAEA's board allowed increases of 2.2 percent and 0.6 percent, respectively, to fund additional safety activities in response to the Chernobyl accident. In 1992, IAEA estimated that it needed an additional \$2.7 million for its 1993 safeguards budget, primarily to fund activities in states coming under safeguards. However, the board authorized only \$1.5 million in additional regular budget funds—a 0.8-percent increase. To offset the difference, the board reduced the proposed budget for nuclear safety programs by \$700,000 and other non-safeguards programs by \$500,000, and reallocated these funds to the safeguards budget.

Beginning in 1991, IAEA began experiencing a funding shortfall, primarily because the Russian Federation did not pay its assessed contribution. While other members also did not pay or fully pay, the Federation owed the most—\$17.6 million in 1991, \$19.7 million in 1992, and \$17.7 million in 1993. To compensate, IAEA had to reduce expenses these years. Table 3.1

²The United Nations adopted the policy of zero real growth based on contributors' concerns about budget growth within U.N. agencies. On the basis of IAEA member states' support, IAEA's board adopted the policy for IAEA.

shows IAEA's revised approved regular budgets for 1991 through 1993 after reductions.

Table 3.1: Reductions in IAEA's Approved Regular Budget (1991-93)

Dollars in millions			
Budget activity	1991	1992	1993
Approved budget ^a	\$187.9	\$201.2	\$229.2
Amount deferred or canceled	7.8	27.3	27.5
Revised budget	\$180.1	\$173.9	\$201.7

Note: Figures are based on an exchange rate of one U.S. dollar equals 11.65 Austrian schillings (1991), 10.95 schillings (1992), and 10.0 schillings (1993).

^aFigures exclude reimbursements for services that IAEA provides to other organizations.

As shown in table 3.1, IAEA reduced expenses by \$7.8 million in 1991. To achieve this reduction, IAEA deferred several activities until 1992, such as the purchase of safeguards equipment and the preparation of safety technical documents. IAEA did not reduce expenses by the full amount of the Russian Federation's contribution because it did not learn until October 1991 that the Federation was not going to pay. By that time, it was too late to significantly reduce some programs. In December 1992, the Federation and other member states had paid \$9.9 million toward their 1991 arrears. As a result, IAEA was able to implement some of the deferred 1991 activities in late 1992. The agency expects to implement the remainder of the deferred 1991 activities in 1993.

For 1992, IAEA anticipated that its financial situation would not improve because it did not expect the Federation to pay its 1992 assessed contribution of \$19.7 million during 1992. Therefore, in January 1992, IAEA reduced expenses across-the-board (equal percentages in all departments) by 13 percent below the approved budget. The amount reduced—about \$27 million—equated roughly to the amount owed by the Federation and other member states that were not expected to pay. In addition to deferring activities, IAEA had to cancel activities, including some safeguards inspections. In anticipation of continued nonpayment, IAEA is taking steps to reduce its 1993 budget by 12 percent across-the-board.

IAEA's Safeguards Program Is Not Fully Funded

Because of zero-real-growth limits and across-the-board reductions, IAEA's safeguards department has been unable to fully fund its safeguards requirements. To stay within budget limits, IAEA's board has reduced the department's budget requests for 1991 through 1993 in amounts ranging

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from \$3.1 million to \$6.1 million. Also, to meet IAEA's overall budget reductions in 1991 and 1992, the department deferred or canceled several activities, including inspections and equipment purchases. IAEA estimates that its funding requirements will continue to grow and has identified about \$21 million for equipment and activities that will not be funded under its proposed 1994 budget.

**Reductions in IAEA's
Safeguards Department
Budget Requests**

From 1991 through 1993, IAEA's board reduced IAEA's budget requests for the safeguards department to meet the mandate of zero real growth. In 1991, however, the board made a special appropriation of \$1.2 million for the purchase of safeguards equipment. This appropriation is discussed later in this chapter. Table 3.2 shows the safeguards department's budget requests for 1991 through 1993 and the final budget approved by the board.

**Table 3.2: IAEA's Department of
Safeguards Budget (1991-93)**

Dollars in millions			
Budget activity	1991	1992	1993
Department's request	\$66.1	\$65.7	\$71.5
Board reductions	3.5	3.1	6.1
Approved budget	62.6	62.6	65.4
Special appropriation	1.2	0	0
Final budget	\$63.8	\$62.6	\$65.4

Note: Figures are based on an exchange rate of one U.S. dollar equals 12.7 Austrian schillings and are indexed to 1993 prices.

According to an IAEA official, the board's reductions in the department's budget requests principally affected the funds needed to replace or upgrade safeguards equipment.

**Deferral or Cancellation of
Safeguards Activities**

In addition to reductions of its initial budget requests, the safeguards department had to cut expenses from its approved budgets for 1991 through 1993 because of IAEA's overall budget reductions due to nonpayment of contributions. To do so, the department deferred or canceled several activities. It was later able to offset some of the reductions with payments received for prior-year assessments and additional extrabudgetary contributions. Table 3.3 shows the department's funding from 1991 through 1993, as of April 1993.

Table 3.3: Funding of IAEA's Safeguards Program (1991-93) (as of April 1993)

Dollars in millions			
Funding	1991	1992	1993
Budget activity			
Final budget	\$63.8	\$62.6	\$65.4
Program reductions	3.8	8.1	7.8
Funds available	60.0	54.5	57.6
Additional funds			
Payments from member states for prior year	2.6 ^a	0	0
Extrabudgetary support	0	3.3	0
Total additional funds	2.6	3.3	0
Total funds available	\$62.6	\$57.7	\$57.6
Amount unfunded^b	\$1.2	\$4.9	\$7.8

Notes: Figures are based on an exchange rate of one U.S. dollar equals 12.7 Austrian schillings and indexed to 1993 prices.

Some figures do not add due to rounding.

^aFigure reflects payments made in 1992 toward unpaid 1991 contributions.

^bFigures reflect difference between the final budget and total funds available.

In 1991, the department reduced \$3.8 million in expenses primarily by deferring equipment purchases. By the end of 1992, it was able to fund these deferred purchases because IAEA received sufficient payments from member states against previously unpaid contributions.

In 1992, the department reduced \$8.1 million in expenses by deferring equipment purchases, canceling several program activities, and postponing the hiring of staff. Canceled activities included

- interim inspections at natural and low-enriched uranium conversion and fuel fabrication plants;
- inspections under voluntary offer agreements in the Russian Federation and the United States;
- training to educate inspectors on the design of new facilities and safeguards techniques;
- laboratory and data processing services; and
- trips to negotiate safeguards agreements, attend external meetings, and maintain equipment at safeguarded facilities.

IAEA was able to offset some of the 1992 reductions because, at its request, the United States and three other member states provided additional extrabudgetary support. The United States provided \$2.7 million to fund equipment purchases and travel to states that had recently signed full-scope safeguards agreements or were considering this action, and the other states provided \$560,000 for equipment purchases. The department will also have to defer or cancel activities in 1993 to achieve a \$7.8 million reduction in expenses, but it hopes to receive extrabudgetary support to offset some of the reductions.

**IAEA Cannot Fully Fund
Its Equipment Needs or
Meet Certain Inspection
Goals**

Due to funding shortfalls in 1992, IAEA had to reduce the number of interim inspections at natural and low-enriched uranium conversion and fuel fabrication plants. As a result, the safeguards department was unable to fully meet its inspection goals for several plants during 1992. Typically, IAEA performs one physical inventory per year at each plant to confirm inventory levels and periodic interim inspections to verify transfers (receipts and shipments) of material. The number of interim inspections varies depending on the type of nuclear material processed through the plant. However, IAEA could fund only those expenses associated with the physical inventory verification and a portion of the interim inspections. According to IAEA, the proliferation risk at natural and low-enriched uranium plants is considered to be low in states that have more readily usable weapons material, such as highly enriched uranium. However, IAEA officials said that it is generally not good practice to cancel interim inspections, especially in states that have only low-enriched uranium under safeguards.

In its 1993-94 budget document, IAEA reported that its financial difficulties are beginning to adversely affect the effectiveness of safeguards activities. IAEA noted:

"In particular, the postponement of the purchase of safeguards equipment needed to replace obsolescent equipment currently in service or to complete the installation of safeguards systems in nuclear facilities coming under safeguards will accelerate the rate of failure of existing safeguards systems and result in delays in the completion of new safeguards systems."

According to an IAEA official, much of its existing safeguards equipment is quickly becoming obsolete and is experiencing high failure rates because of age. For example, the official noted that neutron coincidence counters

used to measure nuclear material are over 10 years old and fail frequently. Because spare parts are no longer available, IAEA takes parts from units that cannot be repaired. If an item fails during an inspection, IAEA usually cannot send a replacement immediately and inspectors have to return at a later date, thereby increasing travel costs. According to the official, these equipment problems have not yet prevented the agency from meeting inspection goals, but could in the future if equipment needs are not addressed.

**IAEA Is Exploring
Opportunities to Reduce
Expenses**

At the urging of its member states, IAEA is attempting to identify ways to reduce the costs of its safeguards program. In 1992, IAEA and the European Atomic Energy Community (EURATOM) signed a partnership agreement and began meeting to discuss ways to increase the efficiency of safeguards inspections. (EURATOM is a regional body that in conjunction with IAEA conducts safeguards inspections in states that belong to the European Community.) Because of differences between IAEA's and EURATOM's inspection methods, scheduling, and staffing, IAEA had to provide more inspectors to participate in joint inspections than needed if it were the only agency conducting the inspections. As of March 1993, they had agreed to modify inspection activities at certain facilities in a manner that will allow IAEA to meet its inspection goals but require fewer inspectors than under the previous arrangements. IAEA estimates that it will save \$500,000, and the two agencies are exploring other potential cost-saving measures.

Furthermore, at the request of IAEA's Director General, IAEA's safeguards advisory group has been studying ways to reduce the cost of the safeguards program but still enable IAEA to meet new requirements and maintain effectiveness. For example, the group is examining whether implementing measures to improve IAEA's capability to detect undeclared activities, such as the use of environmental monitoring techniques, will permit IAEA, in the long term, to reduce certain routine inspection activities. The United States has emphasized that IAEA must ensure that any reduction in inspection effort will not affect its ability to detect diversions of nuclear material.

IAEA officials told us that the opportunities for further streamlining the safeguards budget are limited. They said that because of the forced budget reductions, the safeguards department has few, if any, areas left to cut without reducing effectiveness. They noted that if further reductions are necessary in 1994, additional safeguards inspections and other basic functions may have to be canceled.

IAEA's Future Funding Needs

IAEA has identified about \$21 million in funding requirements for equipment and activities above the amounts included for the safeguards department in the agency's proposed regular budget for 1994. Items for which IAEA does not expect to have funds include

- replacement of aging and obsolete inspection equipment;
- training of member state officials on procedures for establishing national accounting systems for nuclear material;
- equipment to upgrade the capability of IAEA's laboratory to analyze samples obtained during inspections;
- training inspectors to recognize indications of undeclared material and activities and to maintain equipment;
- equipment and software for the agency's information data base; and
- advisory meetings of department staff with consultants to obtain advice on implementing special inspections and other measures for strengthening safeguards.

IAEA officials said that they may also require additional equipment, such as secure communications devices, and assistance from outside nuclear weapons experts to support special inspections.

These officials also noted that if the Russian Federation continues to be in arrears and allowances are not made for safeguards funding increases under zero-real-growth policy, IAEA's regular budget will continue to be insufficient to fund the safeguards program. Therefore, IAEA will have to continue to rely on extrabudgetary contributions. Because the United States and other industrial states tend to be the largest extrabudgetary contributors, IAEA officials believe that relying heavily on extrabudgetary support unevenly distributes the burden and perpetuates the perception that safeguards are of concern only for selected member states and should be paid for almost exclusively by them.

Timing of U.S. Payment to IAEA

In addition to budget limits and program reductions, IAEA experiences difficulties because it does not receive the U.S. assessed contribution until late in its operating year. The U.S. payment represents about 25 percent of IAEA's annual regular budget income. As a budget reduction measure in the early 1980s, the Office of Management and Budget decided to shift the funding of payments to international organizations, including IAEA, into the next fiscal year appropriation. Generally, the State Department pays the bulk of its IAEA payment during the last quarter of the calendar year in which it is due, and the remainder during the following year. Because IAEA

operates on a calendar-year basis, it does not have use of the U.S. payment until the last quarter of its operating year.

Because of the timing of the U.S. payment, IAEA has experienced cash shortages beginning in the third quarter of its operating year and has had to take measures to avoid insolvency, such as postponing safeguards and other activities, delaying payments to vendors, or delaying or canceling travel and procurement. According to IAEA officials, this situation makes it difficult to plan ahead or to operate efficiently during the last quarter, and contributes to the accumulation of cash surpluses (discussed later in this chapter). Once the U.S. money is available, IAEA must quickly obligate the funds before the end of the year. In 1992, the Director General announced that IAEA might not be able to fund its operations for the rest of the year unless it received most of the U.S. 1992 assessed contribution of \$51.5 million by the end of October. The State Department paid \$46.7 million on October 6, 1992, and the remainder on December 31, 1992.

The U.S. practice of paying late has evoked criticism from IAEA and other member states. Critics charge that the United States is sending a mixed signal because it publicly supports IAEA but does not pay on time. According to U.S. officials, it would be politically difficult to adjust the payment schedule only for IAEA and not all international organizations. Also, they stated it would be expensive to begin paying IAEA and the other agencies earlier because to do so could require the payment of 2 years' contributions in the same year.

Options Available to Improve IAEA's Ability to Fund Safeguards

Several options are available that could help alleviate IAEA's financial difficulties in funding its mandated safeguards program. For example, with the board's approval, IAEA could use year-end surpluses—funds remaining unexpended at the end of the budget year and normally credited to member states—to meet unfunded program requirements. IAEA also could establish priorities to ensure that safeguards activities are funded. If these measures do not yield sufficient funds for IAEA's safeguards budget, the board could classify safeguards expenses as nondiscretionary costs, thereby making the safeguards program eligible for funding increases under IAEA's current zero-real-growth policy.

Use of Year-End Surpluses

IAEA has historically reported cash surpluses for years in which it did not spend its entire budget appropriation. From 1980 to 1990, these surpluses ranged from \$8.9 million to \$18 million per year, as shown in table 3.4.³

Table 3.4: IAEA's Year-End Cash Surpluses (1980-90)

Dollars in millions	
Year	Amount of surplus
1980	\$12.9
1981	17.9
1982	12.0
1983	9.4
1984	18.0
1985	10.9
1986	8.9
1987	10.7
1988	12.6
1989	12.3
1990	8.9

According to IAEA officials, the agency was unable to fully utilize its budget appropriations, and therefore accumulated surpluses, for various reasons that were generally beyond IAEA's control. For instance,

- IAEA was unable to implement or fully implement certain programs because it did not receive some member states' payments during the budget year or received them late in the budget year;
- actual expenditures for some activities were less than anticipated at the time IAEA obligated funds, and, IAEA financial regulations did not permit IAEA to spend the unused obligated funds;⁴ or
- IAEA canceled activities that had been deferred from a previous budget year because program requirements had changed.

Unless the board makes an exception, IAEA's financial regulations do not permit IAEA to keep surplus funds to pay for program activities. Rather, IAEA must first use these funds to replenish its working capital fund and

³In the 1991 budget year, IAEA had a deficit of \$4.8 million because some states had not paid. IAEA used its working capital fund to cover the deficit. IAEA does not yet know if a cash surplus or deficit occurred for the 1992 budget year because it is awaiting payments against outstanding 1992 contributions.

⁴IAEA's regulations permit IAEA to use unspent obligated funds if IAEA reobligates the funds by the end of the year in which they were originally obligated. Because IAEA did not know that its expenditures were less than obligations until the end of the year, the agency did not have time to reobligate the unused funds by the end of the year and, therefore, could not use the funds.

then must apply remaining funds against any payments owed by member states for prior years or the current year against their assessed contributions. If funds still remain, IAEA then credits the funds to member states' future contributions on a prorated basis in accordance with its approved scale of contributions for the year in which the surplus occurred.

Of the amounts shown in table 3.4, IAEA either applied the funds to outstanding payments or credited them to future contributions, except for a portion of the 1988 surplus. Specifically, in 1990, at IAEA's request, the board made a special appropriation and permitted IAEA to use \$6.7 million from the \$12.6 million 1988 surplus to purchase safeguards equipment (\$1.2 million) and computer hardware (\$5.5 million) during 1991.

According to U.S. officials, the State Department does not support the use of surplus funds to pay for IAEA's program activities. Rather, the U.S. position is that IAEA should improve its budgeting and planning in order to avoid accumulating large surpluses. The U.S. officials acknowledge, however, that surpluses may occur for reasons beyond IAEA's control.

Prioritization of Activities

In developing its regular budget, IAEA has attempted to maintain a balance between its safeguards and non-safeguards activities because of its dual regulatory and promotional role and the competing interests of member states. Although the United States and others believe that safeguards are IAEA's most important function, many developing countries believe that facilitating the transfer of nuclear technology is just as important. To maintain the balance, IAEA did not establish priorities when forced to reduce budgets in 1992 and 1993 due to unpaid contributions. Rather, each department had to reduce its respective budget by the same percentage. IAEA officials noted that it is difficult to set priorities because each member state has a different idea as to which activities are more important.

In a December 1992 meeting with IAEA's Director General, the Geneva Group—major U.N. and IAEA contributors—encouraged IAEA to develop priorities on an agencywide basis to identify essential and nonessential activities. The group recommended that if IAEA has to reduce its 1994 budget because of unpaid contributions, it consider measures such as eliminating low-priority activities and deferred programs and dispensing with across-the-board cuts to permit increased funding for higher priority activities of some departments at the expense of others. The group did not identify what it considered to be IAEA's high- or low-priority activities.

However, it emphasized that maintaining an effective safeguards system is a prime statutory duty of the agency.

Conclusions

IAEA is the single organization mandated by NPT to verify the peaceful use of nuclear material. Unless IAEA's board takes action to ensure sufficient funding for safeguards, it will be difficult for IAEA to meet its mandate. Using surplus funds, prioritizing agency activities, and classifying safeguards expenses as nondiscretionary costs are viable options for making more resources available for safeguards that deserve consideration. We agree that IAEA should minimize surpluses; however, surpluses may occur for reasons beyond IAEA's control. Given IAEA's financial situation, applying such funds against unfunded safeguards requirements rather than member assessments, is a better use of these funds.

IAEA's proposals for improving its ability to detect undeclared activities may present opportunities to reduce the costs of routine inspections in the future, thereby alleviating some funding shortfalls. However, IAEA must have a proven capability to detect and investigate undeclared activities before omitting any routine inspection activities becomes a reasonable alternative.

Recommendations

To alleviate IAEA's difficulties in funding its safeguards program, we recommend that the Secretary of State encourage other member states on IAEA's board to

- permit IAEA to use year-end cash surpluses, when they exist, to fund program activities;
- require IAEA to prioritize program activities in developing its budget and in implementing any forced budget reductions; or
- classify expenses associated with increases in IAEA's safeguards obligations as nondiscretionary costs and therefore eligible for funding increases under zero real growth, in the event that the use of surplus funds or IAEA's efforts to prioritize program activities do not yield sufficient funding for safeguards needs.

U.S. Technical Assistance Provides Key Safeguards Support; Some Management Practices Are Lacking

Since 1976, the U.S. Program of Technical Assistance to IAEA Safeguards (POTAS) has provided about \$88 million in equipment and other support to IAEA. IAEA officials believe that POTAS has significantly enhanced the agency's ability to apply safeguards. POTAS is effectively supporting IAEA, but its internal management could be improved. The U.S. interagency committee overseeing POTAS has not clearly defined the POTAS project office's responsibilities for monitoring contractor performance. As a result, the project office was not aware that some contractors spent more funds than authorized or encountered difficulties in performing work. Furthermore, until recently, procedures for identifying qualified private vendors may have excluded some from competing for POTAS-funded contracts.

For over 16 years, POTAS, operating within an interagency framework, has been the primary source of U.S. technical assistance to IAEA. In 1992, DOE began making plans to provide direct assistance to IAEA's safeguards department on a regular basis, including some of the same types of support provided under POTAS. However, procedures do not exist to coordinate the two programs to prevent duplication or overlap of work.

Description of POTAS

In 1976, the Congress established POTAS to provide technical assistance to improve the effectiveness and efficiency of IAEA safeguards. POTAS funds projects, referred to as tasks, based on annual requests from IAEA's Department of Safeguards. These tasks involve (1) applied research on, and development and demonstration of, equipment and techniques for safeguards applications; (2) analysis of safeguards issues; (3) training of safeguards personnel; and (4) support to IAEA's Department of Safeguards, such as providing experts and consultants to work with the staff.

The Technical Support Coordinating Committee—an interagency committee composed of representatives from State, DOE, the Nuclear Regulatory Commission, and the Arms Control and Disarmament Agency—sets policy and exercises oversight of POTAS. The International Safeguards Project Office (ISPO), located at a DOE national laboratory, administers the program and advises the committee on technical matters. Among other things, ISPO evaluates IAEA's requests and recommends potential contractors—DOE national laboratories,¹ private U.S. vendors, or individual consultants. Under a DOE order, laboratories cannot compete with the private sector. Unless a task requires the unique capability of a

¹Because of their technical expertise in the field of safeguards, Brookhaven, Los Alamos, and Sandia National Laboratories perform most of the POTAS work assigned to DOE national laboratories.

laboratory, a private vendor must perform the work. ISPO identifies vendors that it considers to be qualified and, if approved by the coordinating committee, forwards a list to IAEA. IAEA makes a selection and lets a contract.²

The State Department funds POTAS as part of the annual U.S. extrabudgetary contribution to IAEA. The program's budget has grown from \$1 million in fiscal year 1977 to \$8.1 million in fiscal year 1993, a total of about \$88 million over the period. State transfers funds to DOE, and on the basis of the coordinating committee's guidance, DOE disburses funds to ISPO to cover the program costs incurred by IAEA, such as for contracts with private vendors, and ISPO's administrative expenses. DOE also disburses funds to the national laboratories to cover the expenses of performing POTAS tasks.

Impact of POTAS on IAEA's Safeguards Program

POTAS is a key source of support for IAEA's safeguards program. Its current budget of \$8.1 million per year is considerable compared to the size of IAEA's total safeguards budget for 1993 of about \$65 million. Furthermore, as the first member state program, POTAS provided the impetus for other states to establish similar support programs.³ As of June 1993, over 500 tasks had been completed under POTAS since its inception in 1976. These tasks have resulted in

- the development of equipment for IAEA safeguards—almost 50 different types, such as nondestructive assay devices,⁴ tamper-resistant seals, computer hardware, and surveillance cameras;
- the development of software for inspection equipment and computer hardware;
- training for all new IAEA inspectors in the use of nondestructive assay, containment, and surveillance equipment;
- system studies that provide information on new approaches, techniques, or procedures for safeguards inspectors; and

²According to a State Department official, the coordinating committee decided that IAEA, rather than ISPO, should let contracts in order to expedite the contracting process and establish a direct link between the user and contractor.

³POTAS is the largest of 14 support programs. The others are funded by EURATOM, Australia, Belgium, Canada, Finland, France, Germany, Hungary, Indonesia, Japan, the Russian Federation, Sweden, and the United Kingdom.

⁴Nondestructive assay is the measurement of nuclear materials without physically affecting the measured material.

- consultants, referred to as cost-free experts, to assist IAEA's safeguards staff in such areas as evaluating safeguards' effectiveness, developing strategic plans, and training inspectors.

According to IAEA officials, POTAS has significantly enhanced IAEA's technical capabilities to account for nuclear material during routine inspections. Because of advanced techniques and equipment provided through POTAS, IAEA has been able to apply safeguards in a more reliable and precise manner. Without POTAS support, especially equipment, they noted that IAEA would have difficulty meeting its inspection goals and developing new safeguards approaches.

Most of the equipment used by inspectors has been developed under POTAS. For example, POTAS developed the Modular Integrated Video Surveillance System—IAEA's primary device for monitoring facility operations between inspections—and neutron coincidence counters—equipment that verifies the characteristics of nuclear material. Although some of the equipment developed under the program is given to IAEA, IAEA generally uses its regular budget to fund equipment purchases, including POTAS-developed items. In addition to developing equipment, POTAS has funded key training for IAEA's inspectors in safeguards techniques and the safeguards department's internal communications and management information systems.

IAEA officials also noted that cost-free experts provided under POTAS are invaluable because they provide staff support that would otherwise be unavailable because of financial constraints. Currently, 20 to 25 experts whose salaries are funded under POTAS are assigned to IAEA's safeguards department and work on key projects, including the department's strategic plan outlining long-term research and development needs. U.S. and IAEA officials emphasized that without these experts, the department would have difficulty executing its activities.

Weaknesses in Some POTAS Management Practices

In November 1991, the coordinating committee hired a private consultant, Koh Systems, Inc., to independently review ISPO's administration of POTAS. In March 1992, Koh reported its observations, including that ISPO's responsibilities for administering the program were not clearly defined and that ISPO lacked a satisfactory mechanism for tracking task progress and expenditures. As discussed below, we corroborated Koh's findings and identified additional areas of concern. The coordinating committee and ISPO accepted Koh's findings, and in July 1993, ISPO implemented a

tracking system designed to improve ISPO's ability to monitor tasks. The committee also established contractor reporting requirements.

ISPO's Responsibilities Are Not Clearly Defined

Under its charter, ISPO is to provide "technical direction" for POTAS and coordinate national laboratories' efforts in support of IAEA's safeguards activities. However, the charter does not define the scope or nature of these responsibilities, such as whether ISPO is expected to directly supervise the work of contractors or to merely monitor their work and handle the program's administrative details. Furthermore, the charter does not specify ISPO's relationship with private vendors or ISPO's authority to obtain information from contractors.

In practice, contractors independently manage and perform the work necessary to accomplish specific tasks. ISPO has limited its involvement during the actual implementation of tasks to monitoring contractors' work. ISPO primarily monitors tasks assigned to national laboratories because its charter does not specifically provide for oversight of private vendors. ISPO staff monitored some tasks more closely than others based on their view of each task's importance.

Although the coordinating committee is responsible for providing guidance, the committee has not taken steps to clarify ISPO's responsibilities. Committee officials agreed that ISPO's charter should be revised, but noted that the committee has been unable to reach agreement on the appropriate scope and nature of ISPO's involvement in monitoring contractor performance.

ISPO Lacked Adequate Information on Contractor Performance

Until July 1993, the coordinating committee had not established written reporting requirements for national laboratories and private vendors. As a result, laboratory personnel did not believe that they were obligated to keep ISPO informed in a complete or consistent manner. In one case, a laboratory took 5 months to provide updated schedule and cost estimates for a particular task. On the basis of ISPO's verbal requests, laboratories provided monthly or quarterly progress reports that provided summary data, such as total expenditures, but did not measure progress against milestones or identify problems. ISPO staff did not routinely contact IAEA and laboratory personnel to obtain more specific information. We found that private vendors generally notified ISPO after completing a task, but did not provide many details while work was under way.

Without detailed information, ISPO did not have an effective means to track whether contractors were meeting milestones and budgets. In January 1992, after a year-end review, ISPO and the coordinating committee learned that in 1991 two laboratories exceeded allocated budgets on 15 of 90 ongoing tasks by a total of \$841,960, in amounts ranging from \$1,000 to \$93,000 per task. To cover the overruns, the committee had to allocate additional funds to these tasks from remaining program funds. In general, the overruns occurred because the laboratories (1) increased the scope of work beyond the approved work plan without authorization from the committee, (2) experienced difficulty in performing the work, or (3) did not track expenditures closely.

For example, the \$93,000 overrun occurred because Sandia National Laboratory needed additional funds to complete work on design documents under a task involving the development of a system to safeguard spent fuel in certain reactors. Its initial work did not meet IAEA's quality assurance standards. The coordinating committee had originally allocated \$660,000 for this task. Even though Sandia spent the additional monies, it still did not produce documents to IAEA's satisfaction. Ultimately, IAEA and the coordinating committee limited Sandia's involvement to a consultative role. Sandia officials said that they underestimated the level of documentation needed to meet IAEA's standards and did not closely monitor expenditures.

Furthermore, ISPO was not always aware of problems that occurred during the implementation of tasks. For example, in November 1990, IAEA contracted with a private U.S. vendor to provide maintenance support for IAEA surveillance equipment, including the establishment of a data base to track equipment performance and maintenance requirements. The vendor delivered a data base in January 1991; however, it did not perform to IAEA's satisfaction. Because the vendor agreed to make adjustments to the data base, IAEA paid the contract amount of \$57,000. By mid-1992, the vendor still had not modified the data base to IAEA's satisfaction. IAEA terminated the vendor's involvement and arranged to modify a commercially available data base to meet its needs. According to a company official, IAEA and company officials had difficulty reaching agreement on operational specifications for the data base. Without well-defined specifications, the official stated that it was difficult to develop a product that was satisfactory to IAEA.

Throughout this time, ISPO officials were not aware of the extent to which the vendor was experiencing problems in reaching agreement with IAEA on

operational specifications and modifying the data base. They said that they did not monitor the task closely because ISPO does not have specific authority to oversee the performance of private vendors. According to IAEA officials, the lack of a usable data base delayed their efforts to monitor equipment performance.

According to ISPO officials, the loss of three of its five staff members during 1992 significantly increased the work load of the two remaining staff, making it difficult for them to stay abreast of all the details of POTAS tasks. As of June 1993, the head of ISPO had hired two new staff members and ISPO is now fully staffed.

**The Committee and ISPO
Have Taken Action to
Improve Task Monitoring**

The coordinating committee and ISPO have taken action to improve ISPO's ability to monitor task progress. In March 1992, following Koh's findings, the coordinating committee directed ISPO to develop and implement a system by the end of 1992 to track the status of tasks. During 1992, ISPO began developing a computerized data base designed to track expenditures and the progress of tasks based on information to be reported by contractors. This data base is to replace an existing data base that was capable only of recording expenditure data. Once operational, the new data base is expected to enable ISPO staff to more readily detect potential problems, such as high expenditure rates and missed milestones.

In July 1993, the coordinating committee approved the use of the data base and issued a policy establishing requirements for contractors to report information on task progress and expenditures to ISPO. ISPO officials are currently loading data extracted from reports previously submitted by contractors into the system and expect it to be fully operational by the end of September or early October 1993. According to ISPO officials, the data base was not available by the end of 1992 because ISPO did not have enough staff to assign full-time to the project. The coordinating committee intends to formally transmit the policy on reporting requirements via letter to the national laboratories. For private vendors, ISPO intends to verbally inform them and provide a copy of the policy at the time that they enter into contracts with IAEA.

**ISPO Procedures for
Identifying Private Vendors
May Have Excluded Some
Companies**

From 1976, when POTAS began, through 1992, the coordinating committee assigned more than twice as many tasks to the national laboratories as to private vendors. Table 4.1 shows the distribution of completed and ongoing POTAS tasks.

Chapter 4
U.S. Technical Assistance Provides Key
Safeguards Support; Some Management
Practices Are Lacking

Table 4.1: Assignment of POTAS Tasks (1976-92)

Assignee	Number of tasks	Percent of total
Laboratories	311	50
Private vendors	132	21
Cost-free experts	137	22
ISPO ^a	45	7
Total	625	100

^aThese tasks are administrative, such as funding travel of IAEA personnel to national laboratories to discuss POTAS work and orientation training for cost-free experts.

According to ISPO officials, the coordinating committee assigned more tasks to the laboratories because the private sector lacked the required expertise. We noted that until July 1993 the coordinating committee had not issued a formal policy on contractor selection. In the absence of specific guidance, ISPO had established procedures for identifying qualified private vendors that might have excluded some vendors from being considered for IAEA work. ISPO informally consulted with personnel from the laboratories to discuss their ability to perform a particular task and to obtain their suggestions for potential vendors. ISPO did not directly canvas the private sector to identify all available expertise. The laboratories' suggestions were generally based on their knowledge of vendors that had previously performed DOE or POTAS work. ISPO then contacted the vendor to verify its capabilities.

Because ISPO did not canvass the private sector, qualified private vendors may have existed that ISPO or the laboratories did not know about and were therefore not included in ISPO's list. One option available to ISPO for widening the pool of potential vendors is for ISPO to periodically advertise an "expression-of-interest" in the Commerce Business Daily, a government publication. This advertisement would identify the general types of expertise required to support IAEA but would not be a solicitation for bids on a particular task. ISPO could then retain a list of respondents and their expertise for use when compiling lists of potential vendors as the need arises.

ISPO and coordinating committee officials acknowledged that current practices may limit the pool of vendors. They said that prior to our review, they were not aware of the expression-of-interest option. In July 1993, the coordinating committee directed ISPO to advertise in the Commerce

Business Daily. ISPO has prepared an advertisement and submitted it for publication.

Coordination of POTAS With Other U.S. Technical Assistance to IAEA

While POTAS has been the primary source of direct technical assistance to IAEA's safeguards program, in recent years some U.S. agencies have provided technical support to IAEA on a limited basis, outside of POTAS, to meet special IAEA needs. For example, State, DOE, and other agencies began to provide specialized laboratory and other technical support in 1991 to assist IAEA's efforts to conduct inspections in Iraq. In 1992, DOE assisted IAEA in obtaining a commercial data base to support IAEA's efforts to compile and analyze data on states' nuclear activities.

In 1992, DOE began making plans to provide direct technical assistance to IAEA's safeguards department on a regular basis. This assistance will be funded under DOE's international safeguards program, and specific work will be performed by DOE's national laboratories, separate from their POTAS work. According to a DOE official, the assistance may include research and development of new techniques and equipment for safeguards applications, inspector training, and development of safeguards approaches for new facilities coming under IAEA safeguards.

Although DOE's direct assistance to IAEA is likely to include some of the same types of support currently funded through POTAS, no procedures have been established to coordinate the assistance provided under the two programs. DOE envisions that it will have an annual meeting and periodic informal discussions with IAEA safeguards staff to discuss potential support that DOE could provide under its direct assistance program. DOE would then initiate work based on written or verbal requests from IAEA. According to a DOE official, DOE's representative to the POTAS coordinating committee would brief the committee on DOE's planned or ongoing work at committee meetings, currently held about once a month. Through this process, the official believed, the two programs would be sufficiently coordinated.

DOE's proposed approach differs from IAEA's current process for requesting member state assistance. Specifically, the safeguards department's support program administration office screens requests from individual IAEA staff members to ensure that the stated needs are valid and reflect departmental priorities. For POTAS, the office submits approved requests to ISPO through the U.S. Mission in Vienna. As discussed previously, ISPO

evaluates the request, identifies potential contractors, and forwards the request to the coordinating committee for approval.

DOE officials believe that IAEA's existing process for requesting member state assistance is too bureaucratic, slow, and inflexible because of the lead time required to undertake research and development projects. IAEA officials agreed that the process is rigorous, but stated that requests can be generated quickly—sometimes in a matter of days. They emphasized that IAEA instituted the process to gain control over technical assistance provided by member states and to avoid having member state officials dealing directly with individual IAEA staff members to obtain requests that may or may not reflect valid needs and departmental priorities.

ISPO and coordinating committee officials are concerned that if DOE bypasses IAEA's existing procedures and initiates work based on informal discussions with IAEA staff, DOE may perform work that is not based on valid IAEA needs and priorities. Furthermore, they noted that if the coordinating committee and ISPO are not informed about DOE's work until after the work begins, POTAS and DOE assistance may duplicate or overlap each other, and gaps in covering IAEA's needs could occur.

Future of U.S. Assistance to IAEA

IAEA has traditionally used POTAS assistance to support routine inspection activities. However, POTAS is beginning to expand its coverage to support IAEA's efforts to improve its ability to detect clandestine activities. As discussed in chapter 3, IAEA expects that it may need additional equipment, technologies, training, and other technical support. As of June 1993, IAEA had not identified all of its specific needs, but had submitted several requests for U.S. assistance—including 11 for POTAS tasks to develop safeguards approaches and equipment and 1 for DOE to provide a data base to support IAEA's efforts to compile and analyze additional information on states' nuclear activities. ISPO officials anticipate that IAEA will submit additional requests for POTAS support and emphasized that POTAS is prepared to support IAEA's needs.

Conclusions

POTAS provides significant support for IAEA's safeguards inspection activities. However, the program's project office does not have the necessary authority to monitor whether contractors complete tasks on time and within approved budgets and meet IAEA's needs. Although the coordinating committee has taken action to implement a system for tracking milestone and expenditure data and establish contracting

reporting requirements, it has not defined ISPO's specific responsibilities for monitoring contractor performance. Furthermore, unless the coordinating committee requires IAEA to include reporting requirements in POTAS-funded contracts, private vendors will not be legally bound to provide information on tasks and expenditures.

In addition, if DOE's direct assistance to IAEA is not coordinated with POTAS and DOE bypasses IAEA's existing procedures for requesting U.S. technical assistance, duplication of effort could occur, and DOE may provide assistance that IAEA management does not want or considers a low priority among its many needs. We believe that the interagency coordinating committee is the appropriate focal point for ensuring that technical assistance to IAEA safeguards funded under POTAS and DOE's international safeguards program is properly coordinated, is not duplicative or overlapping, and is consistent with IAEA's priorities.

Recommendations

To improve the management of POTAS, we recommend that the Secretary of State direct the Technical Support Coordinating Committee to

- revise ISPO's charter to include specific responsibility for monitoring contractor performance and facilitating task implementation, including (1) obtaining information on task progress and expenditures from national laboratories and private vendors, (2) consulting on a regular basis with contractors and IAEA to discuss task progress, (3) assisting in resolving disagreements between contractors and IAEA, and (4) routinely reporting on task implementation to the coordinating committee and
- advise IAEA officials that all POTAS-funded contracts with private vendors must include a provision requiring the vendor to routinely report information on progress and expenditures on POTAS tasks to ISPO.

Furthermore, to ensure that U.S. assistance efforts meet valid IAEA needs and are not duplicative, we recommend that the Secretary of State designate the Technical Support Coordinating Committee as the focal point for evaluating IAEA's requests for assistance funded under POTAS and DOE's international safeguards program and determining whether and how the requests should be met.

Views of U.S. Mission Officials

In commenting on a draft of this report, U.S. Mission officials strongly supported the need for a centralized management structure within the U.S. government to coordinate all IAEA requests for U.S. technical

assistance—not only requests pertaining to POTAS and DOE's international safeguards program, but also for other types of support, such as providing technical expertise on environmental monitoring techniques, intelligence, and operational support for inspections in specific countries. We note that these latter activities do not fall under the purview of the technical support coordinating committee, as the committee is currently structured. Therefore, a restructured coordinating committee or an office within the State Department may be the appropriate focal point.

Member States Satisfied With IAEA's Nuclear Safety Role, but IAEA's Access to Problem Reactors Is Limited

IAEA's role in improving nuclear safety is primarily advisory because member states consider nuclear safety a national responsibility.

Specifically, each member state is responsible for regulating its own nuclear power program and ensuring the safety of its nuclear facilities. IAEA's member states are satisfied with IAEA's advisory safety role.

Since the Chernobyl accident in 1986, IAEA has placed increased emphasis on assisting member states in improving the safety of nuclear power plants. IAEA provides several safety services, including Operational Safety Review Team (OSART) missions. The OSART missions examine the operational safety of nuclear power reactors and make recommendations for improvement. In a November 1991 report, we pointed out that because OSARTS are voluntary, there are no assurances that problem reactors will be reviewed, including several Soviet-designed reactors.¹ Therefore, we recommended that IAEA conduct more OSARTS and be given more discretion in selecting reactors. However, the program remains voluntary, and 23 of the 39 older operating Soviet-designed reactors still have not been subject to an OSART mission. Moreover, as of July 1993, five member states with nuclear power programs still have not had any type of OSART mission.

The international community and IAEA have undertaken efforts to improve nuclear safety in Eastern Europe and the former Soviet Union. IAEA provides technical advice to the group of 24 (the G-24) countries, which is responsible for coordinating safety efforts to these countries.² IAEA is also developing a data base on safety activities for the G-24. Most of the 21 member state representatives we interviewed about IAEA's support to the G-24 were generally satisfied with IAEA's role as a technical advisor. In addition to supporting the G-24, IAEA has initiated special projects to assess the safety of Soviet-designed reactors.

Despite limits on budget growth and budget reductions that resulted in deferred or canceled safety activities, IAEA has been able to meet its basic safety advisory responsibilities. However, it has been unable to fully implement additional safety activities recommended by its membership to strengthen its nuclear safety program. Furthermore, IAEA has relied more on extrabudgetary resources to fund portions of its safety program.

¹Nuclear Power Safety: Chernobyl Accident Prompted Worldwide Actions but Further Efforts Needed (GAO/NSIAD-92-28, Nov. 4, 1991).

²The G-24 consists of Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

Member States Have Defined IAEA's Safety Role

In a February 1992 meeting, most of IAEA's board members agreed that IAEA should not be given a broader role in regulating nuclear safety, but should continue its current role of coordinating safety cooperation among states. This view was supported by safety experts representing IAEA's member states at the International Conference on the Safety of Nuclear Power: Strategy for the Future in 1991. These experts generally agreed that safety should be enforced primarily by national regulatory bodies and plant operators through the conscientious application of existing safety principles, standards, and practices. Many of these guidelines are elaborated on in a series of IAEA documents on safety codes and guides for nuclear power programs. To date, adherence to the guidelines by IAEA's member states has been voluntary. Currently, the international community, with IAEA's support, is developing a nuclear safety convention—a proposed multilateral treaty to improve civil nuclear power reactor safety through countries' adherence to general safety principles.

According to a State Department official, the United States is highly satisfied with IAEA's safety role and does not want IAEA to become an international agency regulating nuclear safety. Several other IAEA member states with nuclear power programs share this view. Specifically, in a May 1993 report on the proposed safety convention, we reported that of the 24 member state representatives we interviewed, 21 opposed a regulatory role for any international organization, including IAEA.³

IAEA Provides Several Nuclear Power Plant Safety Services

Since the Chernobyl accident in 1986, IAEA has placed increased emphasis on providing services to assist member states in improving the safety of nuclear power plants. Among other things, these services focus on states' operational, engineering, and regulatory practices. Major activities include the following:

- The OSART program, established in 1982, reviews operational safety at nuclear power plants and recommends improvements. At the request of member states, IAEA sends teams of 10 to 15 international experts on visits, referred to as missions, to (1) review several areas, including management, operations, and maintenance; (2) compare a facility's operational practices with those employed successfully in other countries; and (3) exchange ideas for promoting safety with facility operators. These missions consist of three types—pre-OSART missions for reactors under construction or at the pre-commissioning stage, OSART missions for operating reactors, and

³Nuclear Safety: Progress Toward International Agreement to Improve Reactor Safety (GAO/RCED-93-153, May 14, 1993).

technical exchange missions that focus on a particular area of an OSART mission.

- The Assessment of Significant Safety Event Team (ASSET) program, established in 1986, sends teams of experts to review the root causes of safety-related incidents at nuclear power reactors, determine generic safety lessons learned, and offer recommendations to plant operators on preventive measures. As of July 1, 1993, IAEA had conducted 48 ASSET missions in 22 countries. For the remainder of 1993, IAEA is scheduled to conduct 11 ASSET missions, of which 9 are scheduled to visit reactors in East European countries and former Soviet republics.
- An incident reporting system, established in 1983, exchanges operating experience on an international level to reduce the frequency and severity of safety events at nuclear power plants. IAEA, in cooperation with the Nuclear Energy Agency of the Organization for Economic Cooperation and Development, is gathering operational information from 28 states on unusual events and sharing this information with member states.
- The International Regulatory Review Team program, established in 1989, sends experts to assist member states, at their request, to help improve the organization, procedures, and practices of nuclear regulatory bodies. As of June 1993, IAEA had conducted two of these reviews—the first in Brazil in 1989 and the second in Romania in 1992.
- Engineering safety reviews, conducted by international teams of experts, assess siting (seismic activity and other external events at plant location), plant design, probability of safety incidents, fire protection, physical plant aging, accident management techniques, and other engineering aspects.
- The International Peer Review Service, consisting of teams of experts, conducts an independent review of states' assessments of the probability of safety incidents at nuclear power plants.
- The Assessment of Safety Culture in Organizations Team service, established in 1992, reviews the effectiveness of a state's philosophy towards nuclear safety based on the principles and recommendations contained in IAEA safety documents.

In addition to these safety services, IAEA also establishes safety standards, coordinates safety research, sponsors safety seminars and training, and prepares publications on safety-related issues. IAEA relies on its own staff, experts, and consultants to carry out its safety activities. During our review, we focused primarily on IAEA's safety services, and the OSART program in particular, to follow up on recommendations made in our November 1991 report.

Not All Soviet-Designed Reactors Have Been Subject to an OSART

As of July 1993, IAEA had conducted 70 OSART type missions at 54 nuclear power plants—including 17 pre-OSART missions, 46 OSART missions, and 7 technical exchange missions. Appendixes III and IV list the countries and plants visited during these missions. According to IAEA, states have taken action to improve operational practices based on recommendations resulting from OSART missions. On the basis of 11 follow-up visits conducted from 1989 through 1992, IAEA reported in 1993 that states had resolved or made progress toward resolving 83 percent to 90 percent of the issues identified during initial OSART missions.

In our November 1991 report, we noted certain factors that limit the OSART program. Specifically, an OSART must be requested by a member state, and the requesting state selects the reactor to be reviewed. Because the program is voluntary, some problem reactors may not be reviewed. For example, safety experts consider 39 older operating Soviet-designed reactors—14 VVER-440 (model 213), 10 VVER 440 (model 230) and 15 RBMK⁴—to have numerous safety problems. However, at the time of our report, IAEA had conducted OSART missions at only 16 of the 39 reactors—6 VVER 440 (model 213) reactors and all 10 of the VVER 440 (model 230) reactors—because the respective states had not requested an OSART mission for the remaining 23 reactors.⁵ The remaining 23 reactors included all of the 15 RBMKs—the Chernobyl type—and 8 VVER 440 (model 213) reactors.

Therefore, we recommended that the Secretary of State propose to IAEA member states that IAEA be given more discretion in selecting reactors for review. State opposed this recommendation, stating that

“a cornerstone of U.S. policy on nuclear safety is that it is a national responsibility, i.e., each nation must take full responsibility for the safe operation of all nuclear facilities under its jurisdiction. Shifting this responsibility to an international regulatory regime could weaken rather than enhance nuclear safety.”

Since our 1991 report, IAEA has conducted 7 OSART missions; however, none has involved the 23 older operating Soviet-designed reactors (VVER 440s and RBMKs) because member states with these reactors have not requested an OSART. According to an IAEA official, IAEA has performed other

⁴VVER is a pressurized water-cooled, water-moderated nuclear power reactor. RBMK is a graphite-moderate, boiling light-water-cooled nuclear power reactor.

⁵Of the 16, 10 were conducted under a project implemented by IAEA using international experts in 1990 to address safety concerns of older Soviet-designed reactors. This project is discussed later in this chapter.

Chapter 5
Member States Satisfied With IAEA's
Nuclear Safety Role, but IAEA's Access to
Problem Reactors Is Limited

safety reviews, such as ASSETS and engineering safety reviews, at all of the 23 older Soviet-designed reactors. In addition, IAEA held a meeting with state officials to discuss the operational history of one of these reactors.

Furthermore, as of July 1993, five states with nuclear power programs—Argentina, Belgium, India, Switzerland, and Ukraine—had not had any type of OSART mission for any of their reactors. Of the five states, Argentina, Switzerland, and Ukraine have requested an OSART mission, currently scheduled for 1994. Table 5.1 shows the number of operating reactors in each of these five states.

Table 5.1: IAEA Member States Without Any Type of OSART Mission (as of July 1993)

Country	Number of operating reactors
Argentina	2
Belgium	7
India	8
Switzerland	5
Ukraine	14
Total	36

According to IAEA's Director General, the present voluntary system for requesting an OSART mission offers no guarantee that installations that might benefit most from IAEA's advice on safety improvements will be subject to an OSART. U.S. officials commented that OSART missions are only a snapshot in time and do not substitute for a thorough technical analysis of safety features. In their view, such analysis will be accomplished for Soviet-designed reactors through specific multilateral, bilateral, and IAEA activities—discussed later in this chapter. An IAEA official, however, noted that the operational aspects of nuclear power reactors, especially those with serious safety problems, need to be periodically reviewed and therefore would benefit from an OSART.

In our 1991 report, we also noted that as of September 1991 IAEA had conducted only 11 follow-up visits to determine if OSART recommendations were implemented. Like OSART missions, follow-up visits are voluntary. At the time of our report, IAEA did not routinely offer to conduct follow-up visits. Therefore, we recommended that IAEA routinely conduct follow-up visits as part of the OSART program. State supported this recommendation and encouraged IAEA to undertake this activity. Since our report, IAEA has included follow-up reviews as part of its OSART program. As of July 1993,

IAEA had conducted a total of 21 follow-up missions. However, follow-up visits remain voluntary and thus are not assured.

IAEA Safety Activities in Eastern Europe and the Former Soviet Union

Because of the Chernobyl accident, the international community has become increasingly concerned about the safety of Soviet-designed reactors in Eastern Europe and the former Soviet Union. IAEA has undertaken specific activities related to improving the safety of these reactors. It is providing technical advice and support to the G-24, which is responsible for coordinating bilateral and multilateral safety assistance in these regions. Also, IAEA has undertaken comprehensive safety reviews of Soviet-designed reactors.

IAEA's Role in Supporting G-24 Safety Assistance Efforts

At a summit in 1989, the major industrial countries, referred to as the G-7,⁶ agreed that all economic assistance to Eastern Europe should be coordinated by the G-24. In 1992, several G-7 countries providing assistance to improve nuclear safety in Eastern Europe and the former Soviet Union agreed that the G-24 should also coordinate bilateral and multilateral safety assistance efforts in this region. It is estimated that up to \$50 billion might be needed to refurbish, repair, and replace nuclear reactors in this region.

IAEA serves as a technical adviser on two G-24 working groups. One group is responsible for working on safety issues related to Kozloduy nuclear power plant in Bulgaria, and the other is responsible for developing safety training programs. IAEA is also assisting the G-24 in collecting data related to national activities in recipient countries and the needs for international assistance. In addition, IAEA is assisting the G-24 Secretariat in establishing a data base on safety assistance efforts to Eastern Europe and the former Soviet Union. IAEA has established data bases containing safety information on RBMK and VVER reactors which will be linked with the G-24 data base. Using the combined data base, IAEA will assist the G-24 in identifying potential gaps or duplication in assistance efforts and determining if there are pending safety issues that require international attention.

In 1992, IAEA asked its member states to endorse a new IAEA role to coordinate safety efforts by collecting, reviewing, and disseminating information on assistance programs to countries in Eastern Europe and

⁶The G-7 consists of the Commission of the European Community, Canada, France, Germany, Italy, Japan, the United Kingdom, and the United States.

the former Soviet Union. However, a consensus for a new IAEA role was not reached. U.S. officials believe that because of the magnitude and complexity of the nuclear safety problems in the region and the enormous potential resource demand, a coordinated effort is the best approach to solve the problems. According to a State Department official, many donors, including the United States, believed that it was more effective for the G-24, rather than IAEA, to coordinate bilateral and multilateral safety assistance.

During our review, we interviewed 21 member state representatives to discuss IAEA's safety program, including the agency's role in addressing nuclear power plant safety in Eastern Europe and the former Soviet Union. These states consisted of 12 with operating nuclear power plants (representing over one half of the countries with operating plants), 2 without any plants in operation but with plants under construction, and 7 without any plants in operation or under construction. Of the 21 officials, 12 supported IAEA's current role as a technical adviser to the G-24, 6 supported an expanded role for IAEA, such as that of an assistance coordinator, and 3 had no comment.

IAEA's Initiatives to Assess the Design of Soviet-Designed Reactors

IAEA has a number of ongoing activities dealing with the safety of Soviet-designed reactors in Eastern Europe and the former Soviet Union. Major activities focus on the safety of VVER 440 (models 230 and 213), RBMK, and VVER-1000⁷ reactors—and include the following:

- In 1990, IAEA initiated a two-phase extrabudgetary program to identify specific design and operational weaknesses of all operating first generation VVER-440 (model 230) reactors. During the first phase, completed in December 1991, IAEA, assisted by nuclear safety experts, conducted safety reviews, including OSART missions at 10 reactors and ASSET missions at 5 reactors. IAEA identified about 100 safety issues and categorized 60 as high safety concerns requiring immediate attention, such as serious problems in identifying and correcting deficiencies in nuclear safety, incomplete operating procedures, and lack of adequate simulators for training.⁸ IAEA established a data base containing recommendations

⁷The VVER-1000 reactors, of which 18 were in operation as of June 1993, are more similar to reactors of Western design than older Soviet-designed reactors. However, questions exist about the quality of these reactors' manufacture and equipment.

⁸At one location—the Kozloduy nuclear power plant in Bulgaria—IAEA reported to the state that the problems were so serious that safety upgrades were needed in order to continue operating the facility. In June 1993, IAEA reported that facility operators had made substantial progress in improving safety at the plant.

that were addressed in the first phase, and also identified short- and long-term activities needed to improve plant safety. During the second phase, still under way, IAEA is assisting states in planning and evaluating modifications to equipment and conduct of operations based on the results of the first phase. Specific activities include site and seismic safety missions, safety review missions, safety workshops, and the preparation of status reports on generic safety issues.

- In 1991, IAEA began a project, using technical assistance funds, to assist states in assessing the safety of VVER-440 (model 213) reactors and determining the priority of safety improvements. Specific activities include development of an accident simulator and preparation of a report on measures planned, under way, and needed to backfit model 213 reactors to improve safety. In addition, as of July 1993, IAEA had conducted a total of six OSART type missions—OSARTS, pre-OSARTS, and follow-up visits—at six nuclear power plants with operating or pre-commissioned reactors, an ASSET mission at one reactor, and two seminars on safety philosophy. In the future, IAEA plans to conduct several activities, including meetings to assess safety-related problems, reviews of safety studies, additional ASSETS, seismic safety missions, and reviews of probabilistic safety assessments of nuclear power plants.
- In 1992, IAEA established an extrabudgetary safety program on RBMK reactors. The program focuses on establishing international consensus on safety issues and priorities for improvements required. This work includes safety review missions at specific plants to review plant design and operation, ASSETS, and reviews of seismic safety. Other activities include meetings of experts to discuss RBMK safety and safety training. As of July 1, 1993, IAEA had conducted ASSET missions at four RBMK reactors. The agency is scheduled to conduct two more in 1993. IAEA also has created a data base compiling information on modifications and safety upgrading programs for RBMK reactors.
- In 1992, IAEA established an extrabudgetary program to identify design and operational safety issues with VVER-1000 reactors and to assist states in prioritizing and addressing safety problems. IAEA has compiled information on some aspects of the safety of these reactors in the framework of its nuclear safety program, including OSART missions, incident reporting system reports, site and seismic missions, and missions for assessing significant safety events. With assistance from experts, IAEA is also conducting various activities, including holding meetings on various safety topics, reviewing safety studies, and conducting training and safety review missions.

IAEA's member states and international organizations have cited the importance of IAEA's activities. At the 1992 General Conference, the U.S. representative remarked that IAEA was playing a key role in addressing the safety problems of high-risk Soviet-designed reactors. In particular, this official noted that IAEA's safety reviews of VVER-440 model 230 reactors and efforts on the RBMK reactors were important steps in reducing the threat of another nuclear power reactor catastrophe. Furthermore, in late 1992, an IAEA advisory group of representatives from international organizations and member states reviewed IAEA's safety programs for Eastern Europe and the former Soviet Union. The participants generally agreed that these programs were very useful and that IAEA's planned activities would respond to identified needs.

Funding of IAEA's Safety Program

Under IAEA's Department of Nuclear Energy and Safety, IAEA's Division of Nuclear Safety implements activities related to the safety of nuclear installations, including nuclear power plants.⁹ Since 1991, the division has experienced reductions in its program and has had to defer or cancel activities. However, IAEA has been able to meet its basic safety advisory responsibilities. Also, because of budget limits, the division has used extrabudgetary resources to fund some activities and charged fees to industrialized countries to cover the expenses of conducting OSART missions.

IAEA's Safety Division Has Experienced Budget Reductions

Between 1991 and 1993, the safety division's regular budget for the safety of nuclear installations was reduced to meet IAEA's reductions resulting from unpaid contributions. Table 5.2 shows the budgets and reductions.

Table 5.2: IAEA's Budget for Safety of Nuclear Installations (1991-93) (as of March 1993)

Dollars in millions			
Budget activity	1991	1992	1993
Approved budget	\$5.4	\$5.3	\$6.0
Program reductions	0.2	0.7	0.8
Funds available	\$5.2	\$4.6	\$5.2

Note: Figures are based on an exchange rate of one U.S. dollar to 12.7 Austrian schillings and are indexed to 1993 prices.

⁹The division is also responsible for radiation safety and has a budget allocation for related activities.

In 1991, IAEA deferred several safety activities, including meetings, the preparation of technical documents, research contracts, and equipment purchases. Because IAEA received some overdue payments during 1992, it was able to implement some of these activities in that year. It expects to implement the remainder in 1993 upon receipt of additional payments. In 1992, IAEA again had to defer or cancel activities, such as meetings, research projects, and the preparation of safety guidelines.

Despite the deferrals and cancellations, IAEA has been able to execute its basic safety activities. However, it has not been able to fully implement additional activities recommended by its membership. Specifically, at the 1991 General Conference, IAEA's members, on the basis of recommendations of the 1991 International Conference on the Safety of Nuclear Power, recommended that, beginning in 1992, IAEA implement several additional activities to strengthen its nuclear safety program. These recommendations included

- expanding and strengthening OSART, ASSET, and other services and promoting the achievement of sufficient national regulatory oversight;
- initiating a process for developing a common basis to judge the safety of nuclear power plants built to earlier standards;
- using the existing system that ranks the magnitude of nuclear-related safety events to publicly disseminate information on such events on a regular basis;
- using the incident reporting system to achieve improvements in the exchange of findings and conclusions of analyses of operating experience;
- establishing safety principles for the design of future nuclear power plants;
- developing international safety objectives for waste management and disposal; and
- organizing the preparation of a proposal for an integrated international approach to all aspects of nuclear safety, toward the framework of a nuclear safety convention.

The General Conference requested that IAEA's Director General develop specific proposals based on these recommendations. However, because of limitations on budget growth, the conference did not authorize additional funding, therefore expecting IAEA to implement these additional efforts within its approved budget.

IAEA estimated that it would take 30 percent to 40 percent of its safety budget to implement measures to respond fully to all of the conference's recommendations. Therefore, in 1992, IAEA identified 17 "urgent"

measures, estimated to cost \$385,000, and planned to fund these measures by phasing out other safety activities. As a result of the 1992 budget reductions, IAEA has initiated only limited action on a few of the "urgent" measures—related to strengthening the OSART program and developing a common basis to judge the safety of nuclear power plants built to earlier standards. IAEA has used its regular budget to fund work on the measures, except for a few activities specifically related to the safety of Soviet-designed reactors, which IAEA has funded with extrabudgetary resources.

For 1993, the safety division requested a budget of \$8.8 million—an increase of \$3.5 million over its 1992 approved budget of \$5.3 million. The requested increase was primarily to cover the cost of implementing the remaining General Conference measures. Of the \$3.5 million, the board approved an increase of \$700,000 for the safety division's budget, reallocated \$700,000 to the safeguards department's budget, and did not approve the remaining \$2.1 million. Therefore, the safety division's approved budget was \$6 million. However, to meet IAEA's overall budget reductions resulting from unpaid contributions, the division had to reduce its expenses to about \$5.2 million. Therefore, it deferred or canceled other activities, such as the completion of coordinated research programs and the preparation of safety standards, practical guides, and technical documents.

Because of its budget constraints, IAEA, during 1993, will only partially accommodate the General Conference's recommendations for additional safety activities. IAEA reports that there will be a modest increase during 1993 in activities related to general safety principles, rules, guidelines, and services, a more comprehensive system of incident reporting and analysis, the elaboration of an international nuclear safety convention, and the provision of peer review services aimed at strengthening national regulatory systems.

**IAEA Relies on
Extrabudgetary Resources
and Fees to Support Its
Safety Program**

Because of zero-real-growth limits, IAEA's safety division has had to rely more on extrabudgetary resources and fees to fund some safety activities. For example, in December 1992, the division director stated that the division did not have sufficient funds to staff 30 professional positions. To fill these positions, member states or other international organizations provided cost-free experts or extrabudgetary funds to finance salaries. One safety official responsible for the OSART program stated that he had 10 professional staff—of which 4 were permanent staff and 6 were

cost-free experts. He said that he did not have the funds to replace the experts if they become unavailable. The division director was concerned that the division was using extrabudgetary resources that were not guaranteed and therefore may not always be available for future activities. Also, as discussed earlier in this chapter, some of IAEA's activities addressing the safety of Soviet-designed reactors are funded with extrabudgetary resources.

Beginning in 1989, IAEA began to charge industrialized member states for the costs of OSART missions when its regular budget could no longer cover these costs due to zero real growth. According to an IAEA safety official, obtaining payments from industrial states for OSART missions allowed IAEA to perform more OSART missions. OSART missions in developing countries continue to be funded with IAEA technical assistance funds. The IAEA official said that some developing countries oppose using technical assistance funds for OSART missions because IAEA has asked that countries substitute an OSART for another technical assistance project. In fact, one state recently canceled a scheduled OSART mission because the government wanted IAEA to pay for the mission through the regular safety budget rather than with technical assistance funds.

Conclusions

The Chernobyl accident clearly demonstrated that a radioactive release from a nuclear accident does not honor national borders, and brought greater attention to the importance of nuclear safety. To minimize risk, the safety of nuclear power reactors, especially those considered to have serious problems, must be reviewed periodically. Giving IAEA discretion to select reactors for OSART reviews does not reduce the responsibility of national authorities to ensure that reactors are operated safely. Rather, such action would reinforce their efforts.

Despite financial limitations, IAEA has been able to execute its basic responsibilities for advising member states on nuclear safety and providing requested safety services. The agency has not had sufficient resources to fully implement additional safety activities suggested by its member states. However, IAEA's membership has not supported an expansion of IAEA's safety budget. To enable IAEA to more fully fund safety activities within the regular budget, its member states would have to assign a higher priority to the safety program. Such action would likely affect funding for other activities, including IAEA's safeguards inspections mandated under NPT.

Member States of the International Atomic Energy Agency

Afghanistan	Ecuador ^a	Kenya	Pakistan ^a	Uganda
Albania	Egypt ^a	Korea, Democratic People's Democratic of	Panama	Ukraine
	El Salvador		Paraguay ^a	
Algeria ^a	Estonia	Korea, Republic of ^a	Peru	United Arab Emirates
Argentina ^a	Ethiopia	Kuwait	Philippines	United Kingdom ^a
Australia ^a			Poland	United States ^a
Austria	Finland ^a	Lebanon	Portugal	Uruguay
	France ^a	Liberia		
Bangladesh		Libya ^a	Qatar	Venezuela
Belarus	Gabon	Liechtenstein		Vietnam ^a
Belgium	Germany ^a	Luxembourg	Romania ^a	
Bolivia	Ghana		Russian Federation ^a	Yugoslavia
Brazil ^a	Greece ^a	Madagascar		
Bulgaria ^a	Guatemala	Malaysia ^a	Saudi Arabia ^a	Zaire ^a
		Mali	Senegal	Zambia
Cambodia	Haiti	Mauritius	Sierra Leone	Zimbabwe
Cameroon	Holy See	Mexico ^a	Singapore	
Canada ^a	Hungary ^a	Monaco	Slovenia	
Chile ^a		Mongolia	South Africa	
China ^a	Iceland	Morocco	Spain ^a	
Colombia	India ^a	Myanmar	Sri Lanka	
Costa Rica	Indonesia		Sudan	
Cote d'Ivoire	Iran	Namibia	Sweden ^a	
Croatia	Iraq	Netherlands	Switzerland	
Cuba	Ireland	New Zealand	Syria ^a	
Cyprus	Israel	Nicaragua		
	Italy	Niger	Thailand	
Denmark		Nigeria ^a	Tanzania	
Dominican Republic	Jamaica	Norway ^a	Tunisia	
	Japan ^a		Turkey	
	Jordan			

^aBoard Member.

Nonnuclear Weapon States Subject to IAEA Full-Scope Safeguards Inspections in 1992

Australia	Luxembourg
Austria	Malaysia
Bangladesh	Mexico
Belgium	Netherlands
Bulgaria	Norway
Canada	Peru
Colombia	Philippines
Czechoslovakia	Poland
Denmark	Portugal
Egypt	Romania
Finland	Slovenia
Germany	South Africa
Greece	Spain
Hungary	Sweden
Indonesia	Switzerland
Iran	Taiwan
Iraq	Thailand
Italy	Turkey
Jamaica	Uruguay
Japan	Venezuela
Korea, Democratic People's Republic of	Vietnam
Korea, Republic of	Yugoslavia
Libya	Zaire
Lithuania	

OSART Missions to Nuclear Power Plants (as of July 1993)

Year	Country	Plant
1983	South Korea	Ko-Ri
1984	Yugoslavia	Krsko
1985	Pakistan Brazil France	Kanupp Angra Tricastin
1986	Finland Sweden Netherlands Germany South Korea	Olkiluoto Barseback Borssele Biblis Ko-Ri
1987	Germany Italy Netherlands Canada United States Germany Spain	Krmmel Caorso Doderwaard Pickering Calvert Cliffs Philippinesburg Almaraz
1988	Sweden Japan France Hungary Soviet Union	Forsmark Takahama St. Alban Paks Rovenskaya
1989	Pakistan Brazil United States United Kingdom South Korea Czechoslovakia Sweden	Kanupp Angra Byron Oldbury Wolsong Dukovany Oskarshamn
1990	Spain Bulgaria Finland	Cofrentes Kozloduy Loviisa
1991	Sweden Czechoslovakia Bulgaria Bulgaria Soviet Union Soviet Union South Africa Germany	Ringhals Bohunice Kozloduy Kozloduy Novovoronezh Kola Koeberg Grafenrheinfeld
1992	France France Japan United States	Blayais Fessenheim Fukushima Daini Grand Gulf
1993	France Slovenia	Gravelines Krsko

Pre-OSART and OSART Technical Exchange Missions to Nuclear Power Plants

Table IV.1: Pre-OSART Missions (as of July 1993)

Year	Country	Plant
1984	Philippines	PNPP
1985	Philippines	PNPP
1986	Mexico	Laguna Verde
1987	Mexico	Laguna Verde
	Mexico	Laguna Verde
1988	Italy	Alto Lazio
1989	China Soviet Union	Qinshan Gorky DHNP
1990	Poland Czechoslovakia Bulgaria Romania China	Zarnowiec Temelin Belene Cernavoda Guangdong
1992	United Kingdom	Sizewell
1993	Slovakia Romania China	Mochovce Cernavoda Guangdong

Table IV.2: OSART Technical Exchange Missions (as of July 1993)

Year	Country	Plant
1989	South Africa South Africa	Koeberg Koeberg
1990	Canada Czechoslovakia	Point Lepreau Bohunice
1991	China Czechoslovakia	Guangdong Dukovany
1992	Brazil	Angra

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